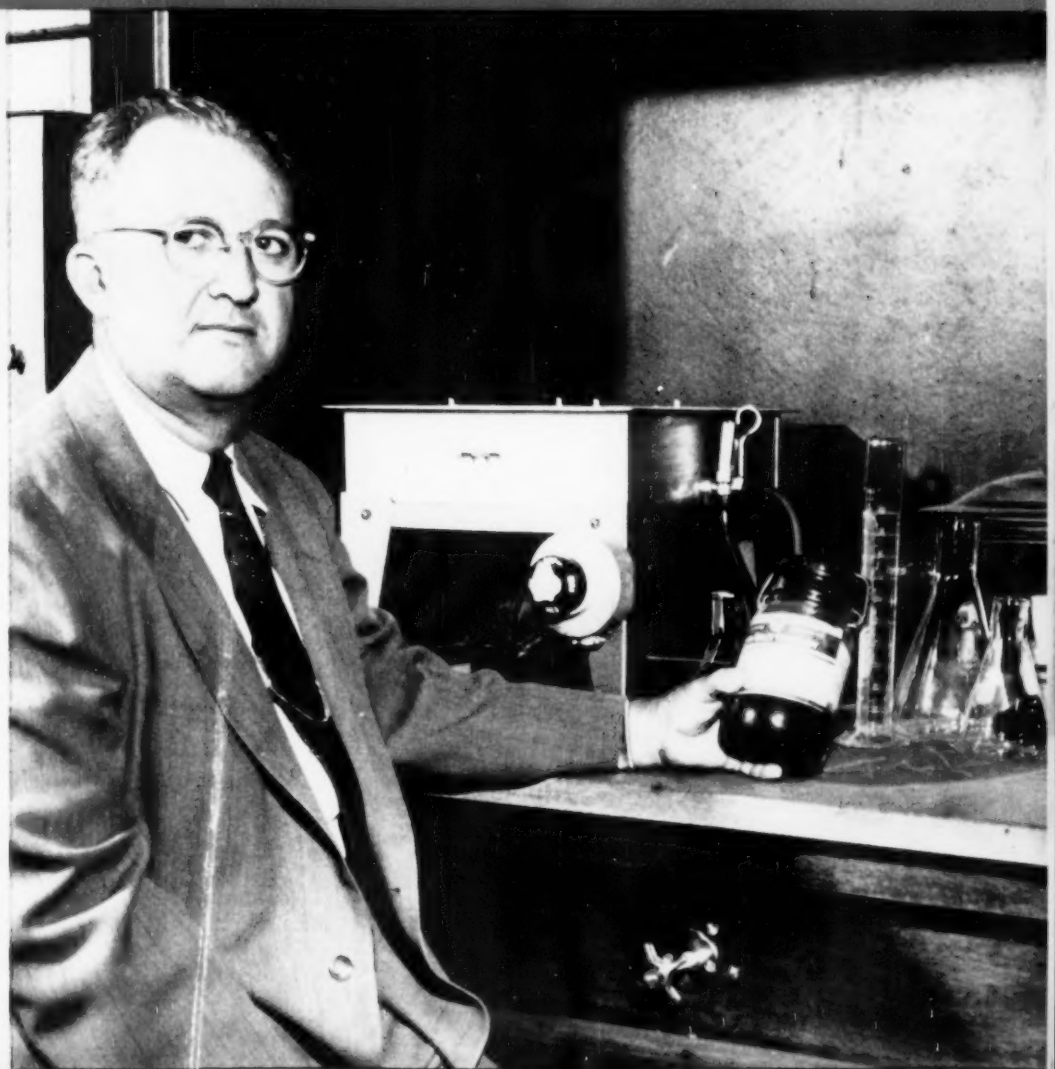
PUBLIC WORKS

Nov. 1954

CITY, COUNTY AND STATE



Joseph J. Gilbert of Link-Belt Co. is in charge of sanitary equipment development, research and sales. Now a Colonel in the Army Reserve, he had a big part in the World War II sanitary engineering program. More on page 20.

The tougher the Bank-Sloping job . . . the more impressive is GALION *performance.*

The operator of a GALION Motor Grader can obtain all blade positions quickly and easily — by hydraulic control from the platform. GALION'S hydraulic shiftable moldboard eliminates many time-consuming adjustments ordinarily necessary . . . heel of blade can easily be positioned inside or outside of tandem tires . . . shifts around obstacles without loss of motion . . . cuts clean and accurate. Write for catalog today.

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NOW - A Teammate for the COMMINUTOR

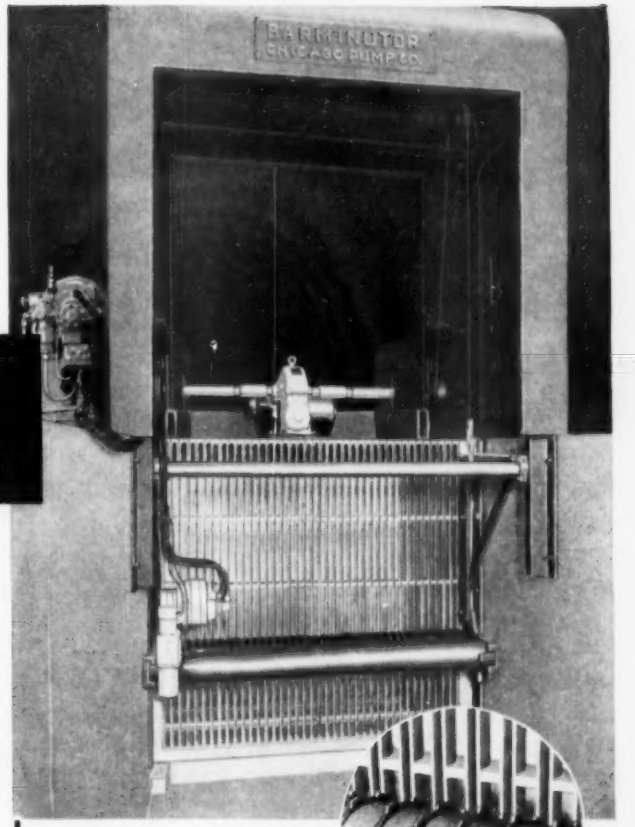
THE BARMINUTOR

Gives Same Clean, Continuous Disposal of Coarse Sewage Matter ...without Removal from Channel

No disposal problems, no unpleasant servicing — the BARMINUTOR cuts all coarse sewage material into small, easily settleable solids—without removal from the channel. Eliminates raking, burial, incineration and grinding. Operation is continuous; manual attention is unnecessary except for periodic lubrication, inspection and cutter sharpening. Power requirements are lower than for mechanically raked screens and grinders. And, since all cutting is done above the grit line, wear is greatly reduced.

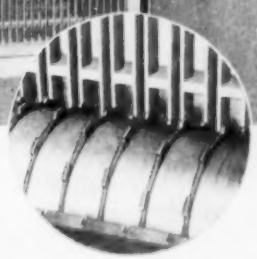
IDEAL FOR TREATMENT PLANTS, PUMPING STATIONS, OUT-FALL SEWERS

The BARMINUTOR can be used in already established influent channels from one to twelve feet wide. No special basin or channel shape is required. Descriptive literature and engineering data is available on request.



▲ Model A. BARMINUTOR for handling larger flows economically.

Close-up of cutters and combs. Cutters rotate within slots of both bar and comb. ▶



EFFICIENCY PROVED

More Than 4000 COMMINUTORS Installed since their development by the Chicago Pump Company 19 years ago stand behind the BARMINUTOR. More than five years of actual operation preceded the installation of BARMINUTORS at a number of modern treatment plants. At the Indianapolis, Indiana Sewage Plant, a BARMINUTOR was subjected to test loads of screenings up to six times the normal 40 M.G.D. load. Comminution time: 6 minutes. Head loss: not in excess of 6".

CHICAGO PUMP COMPANY

SEWAGE EQUIPMENT DIVISION

622 DIVERSEY PARKWAY • CHICAGO 14, ILLINOIS

Flush Bleen, Screw-Feller, Plunger Horizontal and Vertical Non-Clog Water Seal Pumping Units, Samplers

Swing Diffusers, Stationary Diffusers, Mechanical Aerators, Combination Aerator-Clarifiers, Comminutors

NEW

in the No. 12

115 HORSEPOWER

A 15% INCREASE IN POWER

NO INCREASE IN PRICE

The new, improved Caterpillar No. 12 Motor Grader features greater power and from-the-seat starting.

NEW

in BOTH No. 12 and No. 112

One-lever from-the-seat starting

Accelerator-decelerator pedals

Improved hand throttle

Redesigned instrument panel in easy-to-read location

No increase in price

Now there's a new high in performance in CAT* Diesel No. 12 and No. 112 Motor Graders. In keeping with Caterpillar's policy of constant product improvement, both these rugged machines incorporate new features that increase their profit-making capacity. The new No. 12 packs more power, 115 HP—and has faster reverse speeds—low reverse, 4 m.p.h.; high reverse, 6.3 m.p.h. For durability, the capacity of the transmission and clutch has been increased to match the greater horsepower. Other improvements, standard in both the No. 12 and No. 112, are: convenient one-lever from-the-seat starting and the accelerator-decelerator pedals that permit changing speeds without changing throttle setting.

With these and other new features, you can figure on even *more* work at lower cost from the No. 12 and No. 112. Along with the No. 212, they are the only motor graders whose major components are built entirely by one manufacturer and serviced by one organization. Their performance record is unmatched—more than 99% ever built are still in use. Ask your nearby Caterpillar Dealer to show you how these machines can step up production and profits for you!

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

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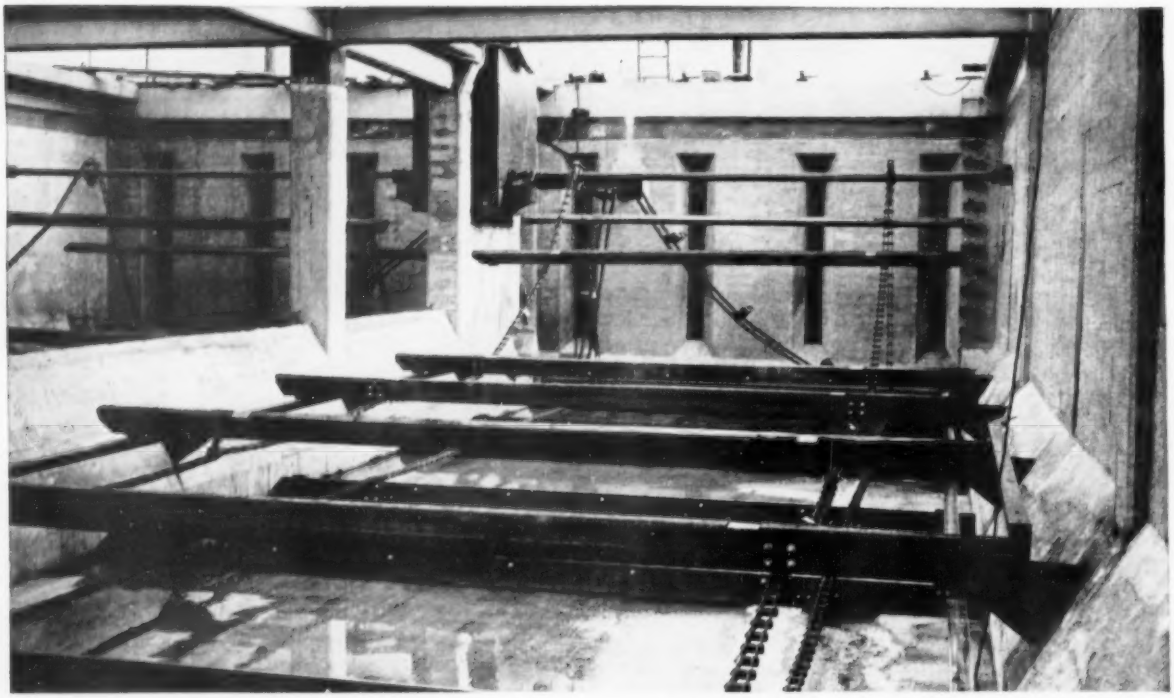
PUBLIC WORKS MAGAZINE

CONTENTS

November 1954 **Vol. 85, No. 11**

Michigan City converts to mechanical flocculation and sludge removal



At Michigan City (Ind.) filtration plant, Link-Belt water treatment equipment has been installed in two existing tanks, and one new tank. Longitudinal and cross collectors can be seen in above photo of settling basins. Straightline mixers are installed in each of three flocculation basins. Link-Belt also furnished all drives (below). Consulting engineer: Boyd E. Phelps, Inc., Michigan City, Ind.

LINK-BELT Straightline Collectors abate lake pollution, reduce chemicals used in water treatment

FOLLOWING the trend by municipal filtration plants to reduce chemical dosage costs by mechanical flocculation and sludge collection, Michigan City, Ind., installed a Link-Belt Straightline mixer and sludge collector system. Immediate results included speed-up of collection and removal . . . elimination of the cost and inconvenience of periodic draining. And because slowly discharged sludge is easily assimilated by the adjacent lake, pollution is no longer a problem.

Link-Belt manufactures a broad line of sanitary engineering equipment—can meet any need from limited to complete modernization of a plant, large or small. Whatever your requirements, our sanitary engineers will be glad to work with your engineers, chemists and consultants—help you get the best in modern water, sewage or industrial liquids treatment.

LINK-BELT

SANITARY ENGINEERING EQUIPMENT

LINK-BELT COMPANY: Executive Offices, 307 N. Michigan Ave., Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World.

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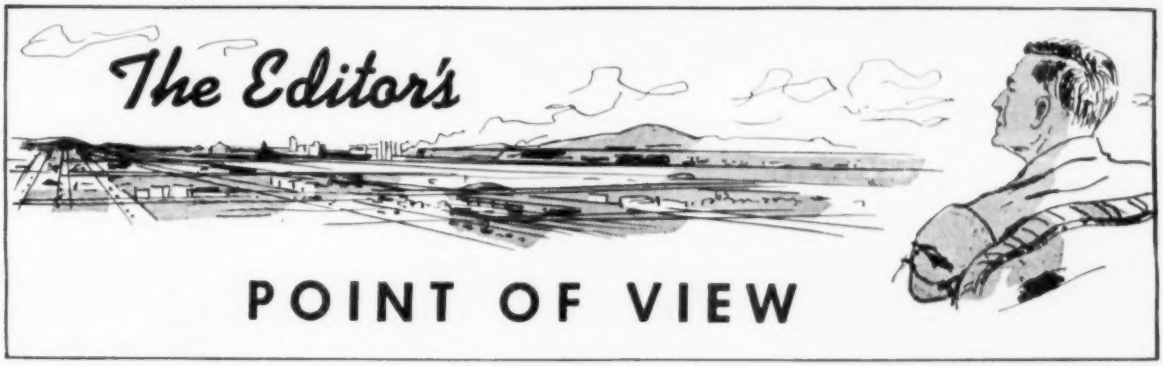


Civil Defense and the Hurricane Season

THREE major hurricanes have swept the Eastern States over the past month. Hurricanes Carol and Hazel did a vast amount of damage; Hurricane Edna swerved away at the last moment from the New York-New England area and did comparatively little damage.

Civil Defense organizations did a fine job in these emergencies. Lack of adequate warning of the approach of Carol handicapped the initiation of protective measures, but Civil Defense helped immeasurably in rescue, clean-up and rehabilitation. With ample advance warning for Edna and Hazel, full defense measures were taken.

A good Civil Defense organization is a great asset, and a comfort as well, to every community.

Are You Ready for This Winter's Snow and Ice?

THIS subject of snow and ice leaves our Southern engineers with a warm feeling of comfort —they don't have to worry; but for the man in the snow belt the problem is a serious one, and provides a lot of very hard work to boot. The immense volume of traffic flooding the highways, even during storms when sensible people ought to stay at home, is a serious and complicating factor. Even a light snow can be compacted quickly by smooth rubber tires into a tractionless and highly dangerous surface.

Looking back to our August issue and the history of the development of snow removal and ice control in New Hampshire, we can almost envy the engineers of thirty years ago. In those days, no one plowed until after the snow had stopped falling; and spreading cinders or sand on the road interfered with the use of sleighs.

Times have changed indeed. High speed snow plows start out now as soon as the special weather forecasts report an appreciable fall of snow is likely. Efficient salt spreading equipment is available and salt is spread freely, sometimes mixed with grit. There is room for more and better use of equipment, which can generally be obtained by two-way radio control; and in the smaller cities, and perhaps in the suburban areas of the larger cities, there is more than room—there is need—for more plows and prompter and better service. There isn't the same danger to a suburbanite marooned a few blocks from home that there is to the cross-country traveler out in a blizzard; but he can get mighty peevish about it. It would be a fine thing to have our cities do as good a job on their streets as most states and counties do on country roads.

Designing for Tomorrow's Sewage Treatment

PEERING into the future is usually a job that produces more brickbats than thank-you notes; yet it is sometimes a good thing to take a look at the things to come. In sewage treatment, four things seem reasonably sure: A greater per capita flow as water using devices increase; more general use of home garbage grinders; plenty of infiltration because of the lax controls over many subdivision sewers; and a continuing growth, for a time at least, in urban populations.

These things mean larger treatment plants and a shorter useful life for present plants. In addition to the larger volume of flow to be cared for, solids disposal units will feel the pinch of overloading.

Good operators are going to be at an increasing premium in the next few years; and so are adaptations of design that will permit easy and economical expansion of plant units. Here are big jobs for our State Sanitary Engineers—to train more operators better—and our consultants —to develop plans for readily expandible treatment plants.

Better Traffic Control Methods and Equipment Could Ease Our Traffic Problems

IF ONE looks backward twenty years or so, he may be amazed at the relatively few changes that have been made for the control of traffic on our city streets. Too many of the tools that were developed and employed when there were half as many cars on the road are still being used; and far too few of the newer methods have been adopted by far too few cities. There should be greater use of one-way streets; parking on our public streets must be held to a minimum to permit traffic to use a greater part of the surfaced way; we have fallen too far behind in adequate lighting of our streets; and signing is often inadequate and confusing. Many of our cities need fresh new thought traffic problems.

SOLVING SOME PRESSING PROBLEMS. City Manager R. E. Froneberger is shown watching many of his problems disappear. The city-owned Bullclam has wiped out complaints he used to receive about smoke and odor drifting from the open dump to a nearby park. He no longer hears about the smoke haze from the open dump that formed over a main highway to make driving downright deadly. And the threat to the city's health from rats, flies and mosquitoes bred on the open dump is past history.

DOZES. Greenwood's INTERNATIONAL DROTT "One-Man Sanitation Squad" dozes 120 cubic yards of refuse daily from haul trucks into gullied area.

COMPACTING. With the refuse in place, the INTERNATIONAL TD-14A with DROTT Bullclam compacts it into a dense mass in minutes by crushing and ironing it with the specially curved Bullclam front.

How Greenwood Buries Its Garbage Disposal Problems

South Carolina city checks 2½ years—then selects INTERNATIONAL DROTT Bullclam Shovel Method of Sanitary Fill; eliminates odors and smoke in park, smoke haze from main highway, health hazard from rats, flies and mosquitoes

For years, the city of Greenwood, South Carolina, burned its refuse but discovered the residents of the city were getting burned up also.

People didn't like the stench and smoke that drifted from the burning dump into the park, nor did they like the smoke haze that enshrouded a nearby main highway and made driving in the vicinity of the dump hazardous. And then, too, an ever-increasing swarm of flies and mosquitoes and rats were being swarmed on the city after deserting their breeding grounds—the city dump. But the Greenwood city administration has buried these complaints for all time by adopting the Bullclam Shovel method of Sanitary Fill with an INTERNATIONAL TD-14A crawler equipped with a DROTT Bullclam.

This equipment was selected only after a careful equipment study that lasted 2½ years and now approximately 18,000 people are benefiting from the Bullclam Shovel method of Sanitary Fill.

The advantages of sanitary fill methods are now generally recognized, but to learn the advantages of the DROTT Bullclam Shovel method of Sanitary Fill as practiced with an INTERNATIONAL crawler and DROTT Bullclam, call your International Industrial Power Distributor for a demonstration today. He'll show you the only machines specially built for this operation and you'll see for yourself how these units are able to handle the greatest amount of refuse daily for the least cost. Call today for details on this "One-Man Sanitation Squad."

INTERNATIONAL HARVESTER COMPANY
CHICAGO 1, ILLINOIS
DROTT MANUFACTURING CORP.
MILWAUKEE 8, WISCONSIN

COVERING. All Greenwood refuse is covered by an earth seal at the end of each day's operation. The Bullclam obtains and transports the cover material to the fill where the earth is spread evenly over the compacted refuse. No settling. No tasty tidbits for flies, rats or mosquitoes to feed on.

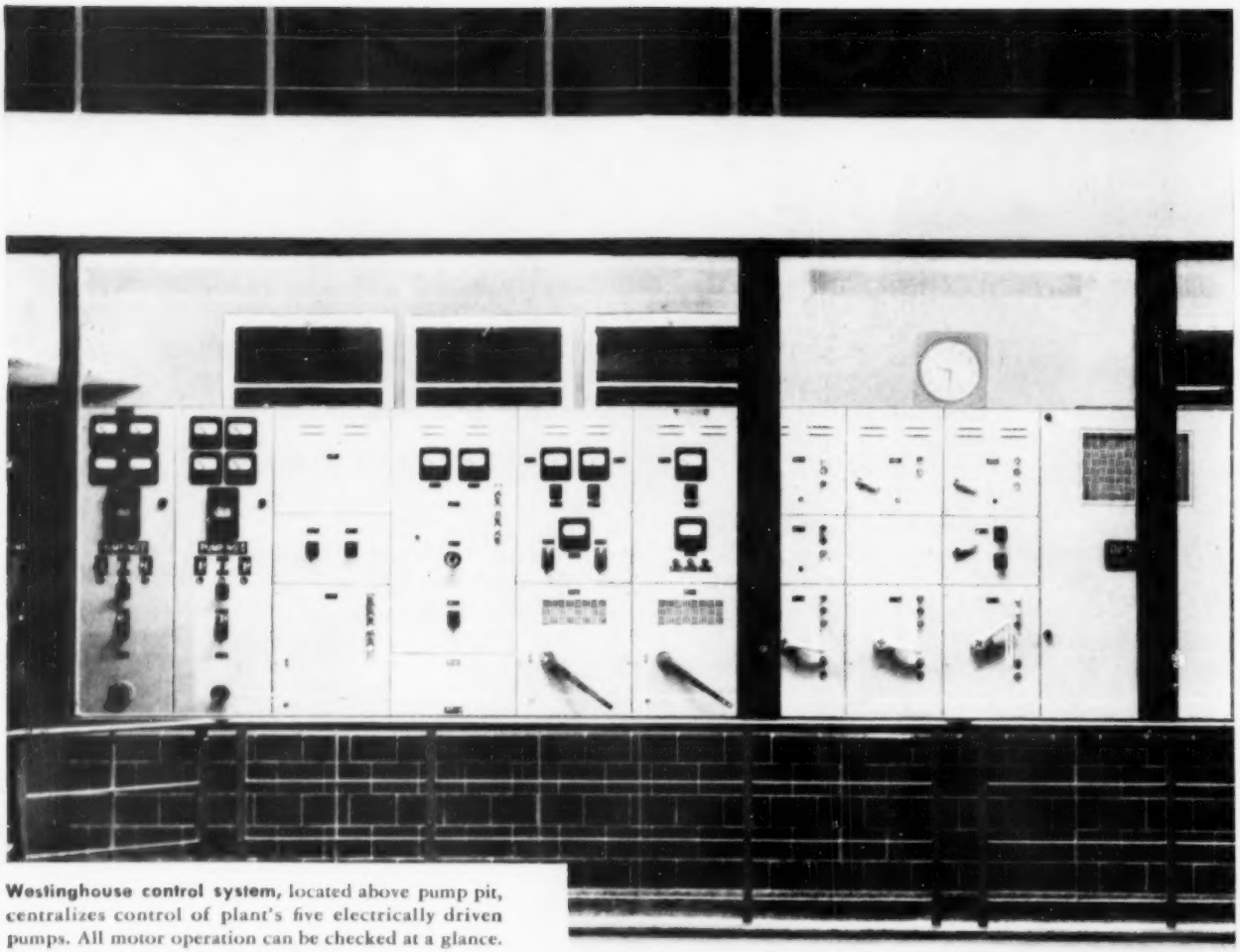
Defender of Community Health

BULLCLAM BY
DROTT

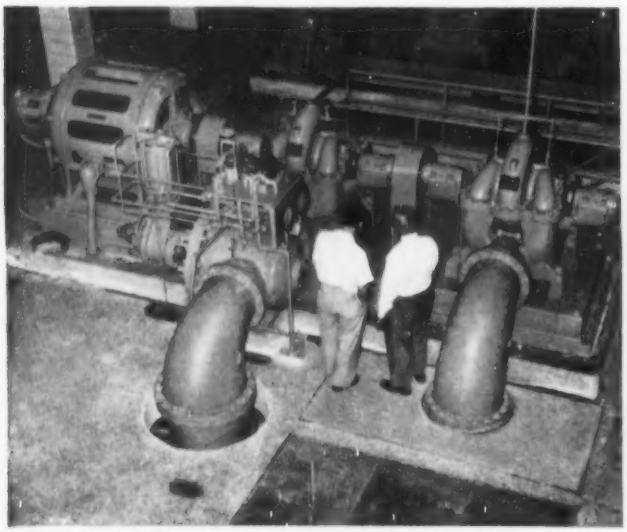
POWER BY
INTERNATIONAL.

INTERNATIONAL HARVESTER

POWER THAT PAYS

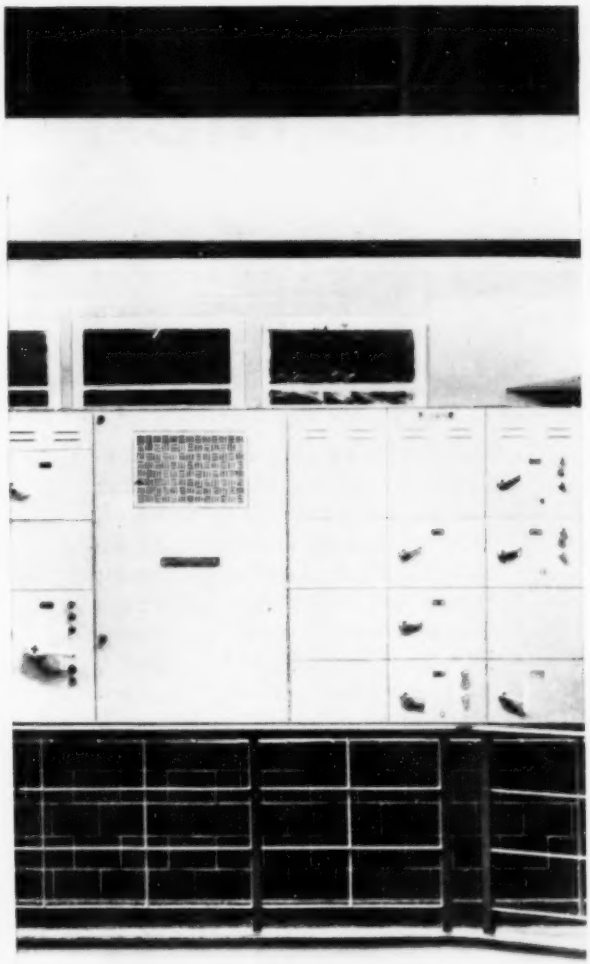


Westinghouse control system, located above pump pit, centralizes control of plant's five electrically driven pumps. All motor operation can be checked at a glance.



Westinghouse synchronous motor (2400 volts, 900 horsepower) operates one of the three 15-mgd electrically driven pumps at the three-million-dollar plant.

New 20-mgd filtration plant, Allentown, Pa. Consulting Engrs., Morris Knowles, Inc.; Electrical Contractor, Dravo Company—both of Pittsburgh, Pennsylvania.



Westinghouse power transformers (12,000 to 2400 volts) furnish the filtration plant's entire power supply. Left background: part of Westinghouse outdoor substation.

Allentown's outstanding filter plant has a centralized pump control system

The new 20-mgd filtration plant at Allentown, Pa., has stimulated considerable interest throughout the waterworks field. This outstanding installation doubles the available water supply and is expected to meet the city's needs for the next 30 years.

From planning stages through installation of equipment, Westinghouse teams worked closely with the consulting engineers. They helped design the electrical system. They matched it with coordinated products that met the plant's rigid requirements for attractiveness, efficiency and simplified maintenance.

How well these were carried out is reflected in the Westinghouse pump control system. Its many switching and control units blend in height and appearance due to their modular construction. Efficiency is assured since the system centralized in one location operation of the plant's pumps. And maintenance is simplified. By being mounted in one line, all units are easily accessible from the front of the board.

This is another example of Westinghouse engineering and product services—ranging from electrical system planning help through design and application of equipment to meet any power problem . . . in any industry.

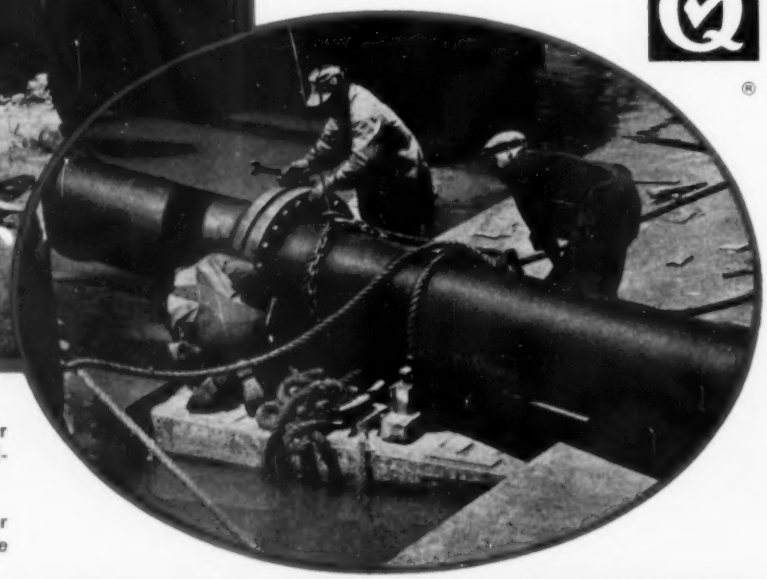
One call to your nearby Westinghouse Office brings this complete service to you, your engineers and contractors. Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pa. J-94021

YOU CAN BE SURE... IF IT'S

Westinghouse

Versatile-

You know, of course, that cast iron pipe is widely used for water and gas mains, pressure sewers and outfalls, and almost exclusively in water filtration and sewage treatment plants. It is not so well known that this versatile pipe is also rendering yeoman service to Industry in keeping down maintenance cost in many applications. Such industries, for example, as chemical, paper, rayon and other process industries; coal mines and oil refineries; railroads and steel plants. Where effective resistance to corrosion is mandatory for long life and economy, specify cast iron pipe. For information write: Cast Iron Pipe Research Association, Thos. F. Wolfe, Managing Director, 122 So. Michigan Avenue, Chicago 3, Ill.



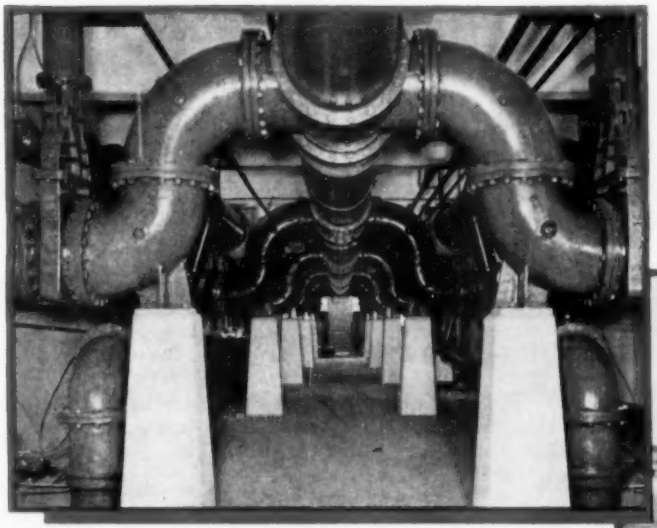
1800 feet of 36" to 60" cast iron pipe for culvert in connection with relocation of railroad tracks in Wyoming

(At right) A river-crossing cast iron water line near Chester, Pa., showing flexible joint assembly.

CAST IRON PIPE

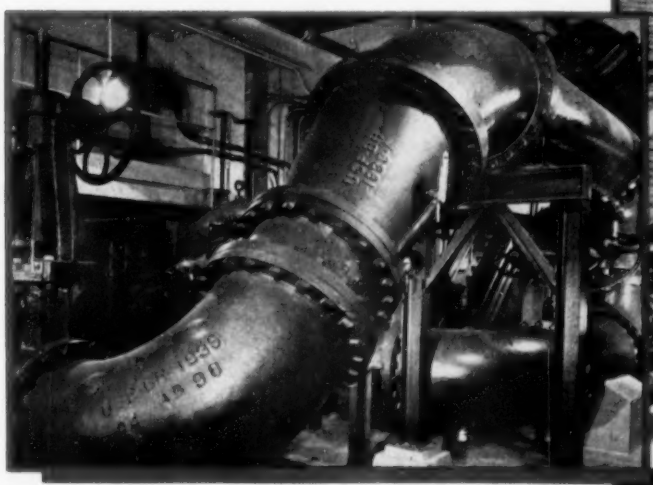
It's a fact . . . our handy Readers' Service card is the way to get new catalogs.

is the word for CAST IRON PIPE



Submarine installation of cast iron flexible joint pipe for outfall sewer into Long Island Sound at Fairfield, Conn.

Cast iron pipe and fittings installed in gallery of water filtration plant in Muskegon, Michigan.



Installation of cast iron pipe and fittings in steam plant of a gas and electric utility in California.

SERVES FOR CENTURIES...

People, Ideas and Events

BY "DOC" SYMONS

H.T.M.A. — And this is the month to give thanks—Thanks that the water shortage was no worse; thanks that the hurricanes didn't hit your city twice, or once as the case may be; and thanks that the predicted recession was mostly political wind.

In September, when I wrote about seeing A. M. (Ted) Roberts, Pres. of Wanakah, N. Y. Water Co., at Cornell Reunion week, I forgot to mention that Ted is the inventor of the Guillotine Pipe Saw, now being manufactured by E. H. Wachs Co. of Chicago.

★ ★ ★

Small World No. 27 — When I heard that Ray McIndoe has gone to Houston, Tex. as Exec. Asst. Manager of the Houston office of B-I-F Texas, Inc., (Southwest Division of B-I-F Industries, Inc.) I was reminded of a small world story about him.

Ray attended Rice Institute in Houston, although he was a native of Pennsylvania—I think. Anyway, early in his college career, Ray noticed that a man who lived across the street, eyed him each time he left or returned home. Finally, Ray stopped the old fellow and asked, how come.

The man said, "Aren't you Ray McIndoe?"

"Yes, but who are you?"

"I'm the doctor who delivered you about 19 years ago!" Small World! ! !

★ ★ ★

Swedefinition — World's best after dinner speech; "Waiter, give me the check."

★ ★ ★

Lexicographers Easy Chair — At the A.C.S. Meeting in New York in September, I heard a man refer to the addition of fluorides to water as "fluorination or fluorinizing". I thought we had established that the proper word for the process is "fluoridation". Apparently, there are a few die-hards or uninformeds still around.

Reminds me of the story of the man who, after years of study of photosynthesis concluded that it should be called "phytosynthesis", but every time he wrote it that way, an editor or printer thought it was a typographical error, and changed it.

★ ★ ★

Such is Fame ? ? ? — At the NYSIWA meeting in Syracuse last June, I saw Fred Biele, Cons. Engr. of Huntington, L. I., and the conversation went something like this—

"Hi Fred. It's good to see you."

"Hello Doc, I was just talking about you with the wife of one of our members. She said she was always a bit leery of any program where you were scheduled to speak because she never knew when you were going to slip in an off-color joke."

Oh Me! About 1946-47, I gave a number of talks on public relations and on how to write a paper. To illustrate the points I wanted to make I used several stories I had clipped from Readers' Digest and Coronet Magazine, etc.

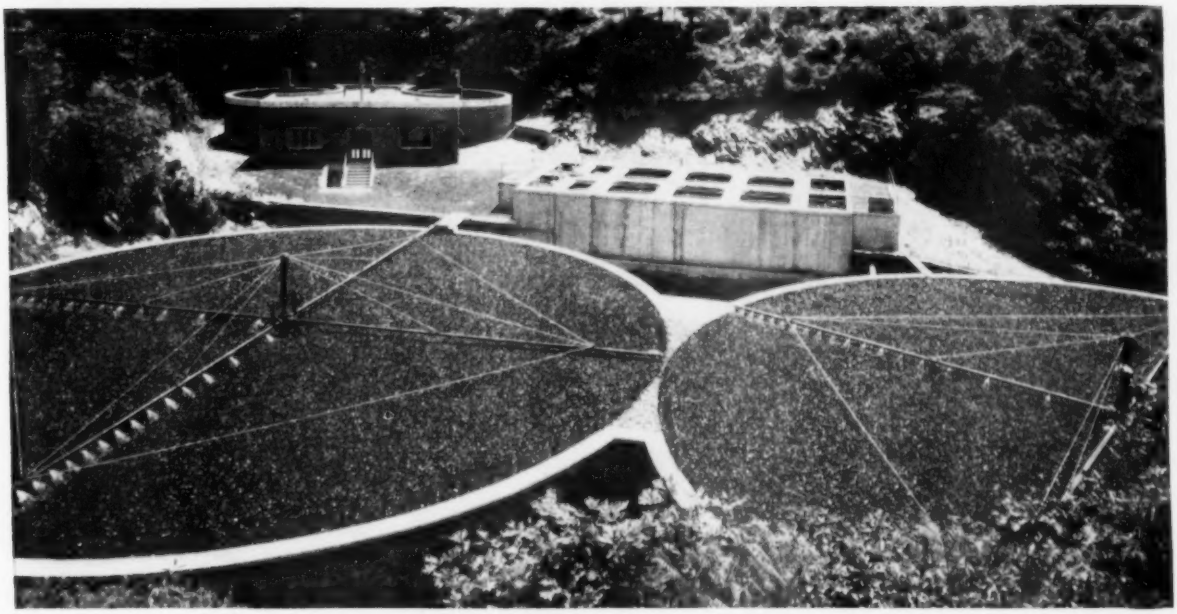
And seven or eight years later I have a reputation for telling off-color stories.—Oh Me! ! !

★ ★ ★

Society of Council Bluffers — Since the minutes of the meetings of this "august organization" appear in this column from time to time, it appears that this is the logical place to publish the membership roster, to wit:

Members — Harry Boehner (V. P Permutit); A. E. Griffin (Tech. Serv. Dir., W & T); Mr. and Mrs. E. M. "Casey" Jones (V. P., Simplex Valve & Meter Co.); Mr. and Mrs. Wendel R. LaDue (Gen. Mgr., Water

Foreground: enlarged filter bed with 2 PFT 100′ Rotary Distributors



At Downingtown, Pennsylvania . . .

Existing structures are put to better use

WITH MODERN PFT EQUIPMENT

Serving a population of 10,000, Downingtown's old (1916) sewage treatment plant faced the problem of capacity—its circular Imhoff Tank and fixed nozzle filter bed were inadequate for current needs. Solution: expansion from present structures using *PFT equipment for more effective treatment!*

To improve the filter system, the original fixed nozzle filter bed was enlarged and converted into two circular filters, each 100 ft. in diameter. A *PFT Rotary Distributor* is installed on each bed for uniform distribution and trouble-free service. Specially designed spreader jets on the PFT Distributors reduce clogging and are easily cleaned.

The Imhoff Tank was converted to a digestion tank and a second tank was added, both 25′ in diameter. A *PFT Floating Cover* is installed in each digester for positive scum submergence, safe utilization of gas and simplified operation. A PFT Supernatant Liquor Selector in each digester provides automatic, continuous withdrawal of the best digester liquor.

A new control building located between the digesters contains additional PFT equipment for operational control: (1) *Supernatant Gauge, Sight Glass and Sampler* units for close control of supernatant withdrawal, (2) *Gas Safety Equipment*, (3) *Heater & Heat Exchanger* unit with capacity of 250,000 B.t.u. per hour. Fired by either gas or oil, the heater utilizes all gas produced by the digesters, switching to oil only when necessary. Heating *externally*, the unit allows complete accessibility and simplifies cleaning and maintenance.

Design of / Edwin B. Wagner,
plant by / Downingtown, Pa.

P.F.T.

waste treatment equipment
exclusively since 1893

PACIFIC FLUSH TANK CO.
4241 Ravenswood Avenue
Chicago 13, Illinois

NEW YORK • LOS ANGELES • SAN FRANCISCO • CHARLOTTE, N. C. • JACKSONVILLE • DENVER

Now's the time to mail this month's Readers' Service card.

Works and Sewerage, Akron, Ohio); Sam F. Newkirk (Engr. and Supt., Bd. of Supervisors, Elizabeth, N. J.); Mr. and Mrs. Daniel J. Saunders (V. P., Permutit Co.); the late Jake VanAtta and Mrs. Van Atta (R. B. Carter Co.); and George E. "Doc" Symons (he wears four hats).

Associate Members —Mrs. Boehner, Mrs. Griffin, Mrs. Newkirk, and Mrs. Symons.

Half-Assoc. Members — Mr. and Mrs. Reg Hayes (V. P., Hydraulic Development Co.); Mr. and Mrs. Shep Powell (Cons. Engr., Baltimore); Mr. and Mrs. W. F. Rockwell, Sr. (Bd. Chair. Rockwell Mfg. Co.) and Mr. and Mrs. Ed Showell (Cons. Engr., DuPont).

You will note—I hope—that in this membership we have two past presidents of AWWA and four past presidents of the WSWMA, and three of our members are Honorary Members of AWWA. Explanation of the membership grades was given in the August issue.

★ ★ ★

The N. Y. Sect. AWWA held its Fall meeting at Montauk, L. I., just nine days after Hurricane "Carol" had hit that vicinity and just when "Edna" was coming up the coast.

As a result of the visits of these two "girls", registration at the meeting did not come up to the advance reservations but more than 415 persons did show up; by far the largest attendance ever at a N. Y. Sect. meeting.

Although many persons had planned to stay over the weekend, the continued storm warnings of the approach of "Edna" frightened everyone away. By mid-afternoon on Friday, the last guest at the hotel had checked out; a distinct disappointment to the management, no doubt.

Not disappointing at all was the interest shown in the new feature of the N. Y. Section meeting, the "Water Works School". Attendance at the session was highly gratifying to the Exec. Comm. which had inaugurated the idea and to "Doc" Symons and Art Luce who presented the first two lectures. These were on the distribution system. Next school session will take up the problem of services.

★ ★ ★

It's an idea! — A great many people scoff at committees with deriding definitions. In an effort to overcome this adverse criticism, many committees nowadays are called Task Committees, to emphasize that

work is being done. In Europe, such committees are called "working parties"—not a bad idea, either.

One man who believes in committees is W. L. Stewart of the Union Oil Co. who once told the Am. Pet. Inst., "I don't think we give enough credit to the accomplishments of committees. For committees can do things that no individual could do so well. The Committee is the essence of the democratic process in action. It is the forum where divergent views of the extremists can be melted, or more often hammered into more calm, more sane and more sound principles. It is the medium whereby the impetuousness of the rash and the dragging feet of the frightened are geared to a productive pace with results that more nearly approach a proper course than any one member could have arrived at alone."

★ ★ ★

Luminous Quote — One quote there is, that I cannot abide—"Be not the first by whom the new is tried, nor yet the last to lay the old aside". Rather on my wall reside, "Without someone, who new ideas has tried, progress aborning would have died!"

★ ★ ★

News Notes from Brushy Bend —On Sept. 14, 15, 16, 21, and 22, District Water Works Meetings were held in five Indiana towns. These were one day meetings under the auspices of the Indiana State Health Dept., sparkplugged by George Fassnacht, Chief, Water Supply Div., Bur. of Environmental Health.—These are excellent examples of the "grass roots" approach to spreading the gospel of the water works industry.

Sept. 28th was the day of the 17th annual meeting of the Sewage and Industrial Wastes Works Operators of Southern, Ill., at Mount Vernon

★ ★ ★

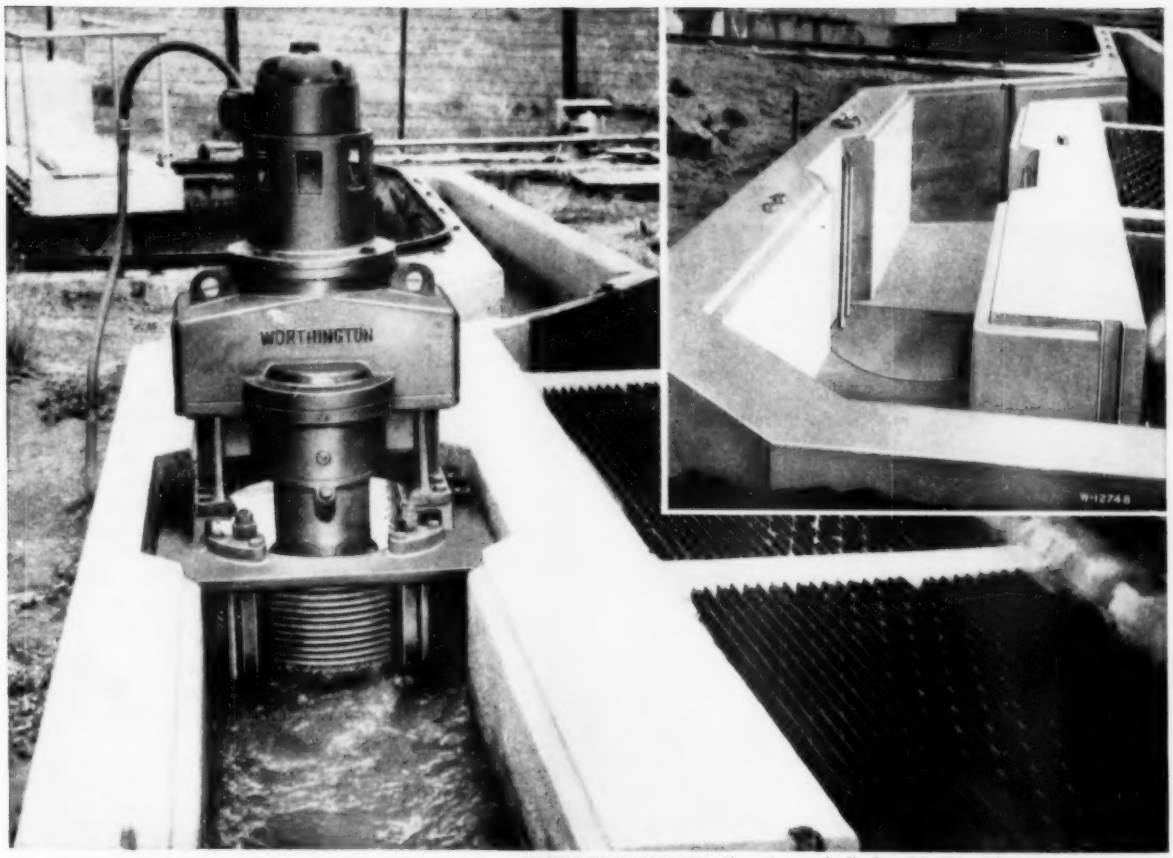
Next month—Something on the Federation meeting in Cincinnati.

V. T. Y.—Doc Symons

• • •

Federal Aid Highway Construction

For the calendar year 1953 the state with the lowest percentage of state highway construction under Federal aid was Massachusetts with 28.4, while the highest was Montana with 100 percent. Almost half the states fell between 50 and 70 percent.



SIMPLE SIDE CHANNEL (inset) was built for this Worthington comminutor at Klamath Falls, Oregon, because Mr. E. A. Thomas, the City Engineer, wanted to use the existing channel as a by-pass.

Low installation cost swings Klamath Falls to Worthington

Since the Worthington comminutor is designed so that raw sewage flows straight through its screen, it's easily installed in a straight rectangular sewage channel.

Result? Expensive masonry work is not needed, which makes for simplified, low-cost installation.

This was an important factor in the selection of a Worthington 25C6 comminutor as part of recent improvements at the Klamath Falls, Oregon, Sewage Treatment Plant.

This comminutor, installed downstream from a grit chamber and upstream from a clarifier, was lifted directly from its packing crate and set right in the channel in a minimum of time.

Easy-to-remove cutter racks for occasional sharpening and the built-in flood protection provided by a mercury seal are other advantages of the Worthington comminutor.

Get all the facts and figures on the rugged Worthington comminutor. Check with your nearest Worthington district office. Or write today for new engineering manual on comminutors, W-317-B17. Worthington Corporation, Public Works Division, Harrison, N.J.

W.4.5

"See the Worthington Corporation Exhibit in New York City. A lively, informative display of product developments for industry, business and the home. Park Avenue and 41st Street."

WORTHINGTON

ALL MAJOR PUBLIC WORKS EQUIPMENT UNDER ONE RESPONSIBILITY

Water Works Pumps • Sewage Pumps • Comminutors • Vertical Turbine Pumps • Vacuum Pumps

Get full details of this month's products... mail your Readers' Service card today.

LEADERS IN PUBLIC WORKS

Joseph J. Gilbert is an outstanding sanitary engineer and manager of the Sanitary Engineering Division of Link-Belt Co., but he is probably best known for his services in the Army during World War II. Entering as a Captain early in 1941, he was assigned to headquarters of the Sanitary Corps in Washington; during the next four years he very largely shaped the personnel of that Corps and administered much of the sanitary engineering program throughout the world. The value of his services, and the extent of the contributions he made will probably never be fully appreciated. Though the cover picture was taken in the laboratory of the sewage treatment plant which he designed for Link-Belt's Colmar plant, it is reminiscent of him as he looked when engaged in his favorite sport of putting something over on the doctors, with whom, nevertheless, he was a great favorite. The writer of this brief can testify that service with Joe was never dull. He is now a reserve Colonel, a rank which he has richly earned after more than 20 years of active and reserve service.

A graduate of the University of Pennsylvania, with special work at Drexel, he is a man of many attainments and overflowing energy. He runs the dinners of the Order of the Boar. His flowers and his garden are outstanding. He is a fair to good golfer; his pinochle is good, but his bridge is something else again. Fishing is another hobby, and he is also interested in color and stereo photography. He lives in a delightful house, built to his own ideas in Abington, with Mrs. Gilbert and his daughter.

UP FRONT FOR ADEQUATE ROADS

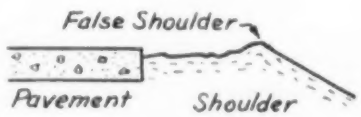
by

LEO J. RITTER, JR.

Creosoted Highway Fence Posts—An editorial in the September issue of *Wood Preserving News* tells a remarkable story of the longevity of creosoted timber fence posts. As a part of the relocation and widening of a section of Washington State Highway No. 12 between Stella and Longview, 2500 pressure creosoted Douglas fir fence posts originally installed in 1932 were removed. After more than 20 years of service, all but 10 of these posts were in such good condition that they were cleaned, painted, and re-installed on the improved highway. Their salvage and re-use on this one job represents a saving of more than $15,000.

Shoulder Maintenance — We've been looking over one of the advertising releases of the Allis-Chalmers Mfg. Co., Tractor Division, Milwaukee. This one deals with the process of maintaining the shoulders of a paved road with a motor grader equipped with a scarifier attachment.

Thoughts expressed in the bulletin tie in directly with those we presented last month about the advantages of gravelling ditch to ditch. The advantages of maintaining a smooth, adequately drained shoulder along a paved road are obvious—greater safety, better drainage, and easier maintenance. A particular problem is the presence of a false shoulder, like this:



This difficulty can be corrected by the following steps:

(1) Loosen the packed shoulder material by using the scarifier attachment.

(2) Grade the material from the shoulder area (gravel, we hope) into a windrow on the edge of the pavement.

(3) Cut off the false shoulder, spreading the dirt over the shoulder area. If this contains excess sod, this material may have to be removed by using, say, a rear-end loader attachment on the grader loading into a truck.

(4) The gravel is then spread back over the dirt from the false shoulder, shaping it to the desired slope. You then should have a smooth, well-drained shoulder, like this:

The President's Program—Plans for implementing the proposal for a ten-year, $50 billion highway program, made by President Eisenhower at the Governors' Conference last July, continue to shape up. Gen. Lucius Clay has been named as chairman of a new Advisory Committee on Highway Improvements, although members of the committee had not been named at the time this is being written. The committee presumably will report to the President before January, so that a program can be submitted to the next session of Congress. In the main the Governors' Conference seems to be in favor of the idea, since the chairman of the Conference, Kennon of Louisiana, has said that there is "every prospect" that a $50 billion highway program would become law early in 1955. Press and association reaction to the program seems to be generally favorable, although some dissenting voices are being heard. For example, the *Wall Street Journal* said "We don't think the Federal Government has got to draw up 20-year plans and appropriate billions to get roads built." That staunch states' righter, Gov. Fine of Pennsylvania, was quoted as

REPORT ON WINTER OF 1953-54!

How STERLING *AUGER-ACTION* ROCK SALT helped save over 100 TIMES* the total cost of DETROIT'S ice and snow-control program

*Figures courtesy Glenn C. Richards, Commissioner Department of Public Works, Detroit, Mich.

Here's What Happened When The Motor City Fought 35 Snow Storms With STERLING *Auger-Action* ROCK SALT

MINIMIZED EMPLOYEE LATENESS AND ABSENTEEISM

City experts agree that each of Detroit's 35 snow and ice storms, *without* rock salt's prompt action, would have meant an average ½ hour delay per employee in to-work transportation. $55,638,205 in *saved* man hours! Impassable streets would have cost retailers an estimated $26,342,500! And Detroit Street Railways would have lost more than $2,000,000 in uncollected fares. A total estimated saving of $83,980,705!

SAVED MILLIONS FOR DETROIT TRUCKERS, TOO

Detroit's Trucking Association reports a normal *full day's work* throughout the city's 35 storms last year. If streets had remained snowbound or slippery, they would have had only an average of a *half* day's work for a full day's pay—plus gasoline and maintenance costs. Estimated savings—*seven million dollars!*

HELPED LOWER AUTO LIABILITY AND COLLISION INSURANCE RATES

Though other factors besides the city's "Bare Pavement" policy entered into it, the fact remains that Detroit's liability and collision insurance rates are only about one-half those of other cities of comparable size which do *not* use straight rock salt ice-and-snow-control methods.

IN MAN-HOURS IN DOLLARS **STERLING *AUGER-ACTION* ROCK SALT** **COSTS LESS SAVES MORE**

City, County, State Highway Officials!
SEND THIS COUPON TODAY!

International Salt Co., Inc., Scranton 2, Pa.
The Detroit Report interests me. Would like to know how Sterling *Auger-Action* Rock Salt might effect similar savings in our program. Please have representative call.

Name _____ Title _____
Department _____
Address _____
City _____ Zone _____ State _____

Now's the time to mail this month's Readers' Service card.

saying ". . . We want to continue to build our own roads unimpeded by any Federal system. We want the Federal Government to get out of the gas tax and fuel oil fields once and for all."

That's Torn It — According to the dope we have, the ARBA meeting and the Highway Research Board have been scheduled in direct conflict in January. The ARBA meeting, which will feature an exhibit of highway materials and supplies, will be in New Orleans January 10-13 and the Highway Research Board will meet in Washington January 11-14. If this is correct, this is something this writer just can't seem to understand, since these are two of the most important groups in the highway field in this country today. One effect, we think, may be to all but kill ARBA's Educational Division, since many of the key members of this group have a pressing interest in the Highway Research Board, largely because of the large volume of sponsored highway research now being conducted in colleges and universities.

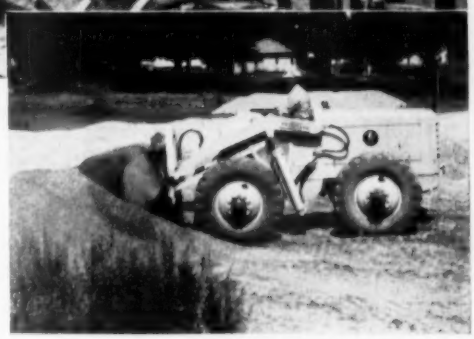
Flexible Pavements —The Highway Research Board has issued a new publication "Design of Flexible Pavements", Research Report No. 16-B. This bulletin contains six papers dealing with flexible pavement design, which were presented as a sort of symposium at the last annual meeting of the Board. It marks another notable contribution of the committee on Flexible Pavement Design, which has long been one of the most energetic of the many committees of the Board. Kudos go to A. C. Benkelman of the Bureau of Public Roads, who is the committee chairman.

NHUC Publication — Another attractive publication has reached our desk from the National Highway Users Conference, Washington, D. C. This one is "The City Traffic Muddle—What Exits?". It presents the highlights of one of the panel discussions held last May during the Fifth Annual Highway Transportation Congress; members of the panel were W. S. Lampe of the Detroit Times, Henry Barnes of the City of Baltimore, Glenn Richards of the City of Detroit, D. C. Greer, Texas State Highway Engineer, and David Lawrence, Mayor of Pittsburgh. Recommended reading for all city engineers and officials.

Just Visiting — Spent a couple of hours recently with Joe Leadabrand, Manager of the Soil-Cement Bureau

"nothing else comes close to it"

"Nothing else comes close to it", says Supt. Allen on this concrete-pouring job. This 4-wheel drive "PAYLOADER" carried and poured 40 yds. of concrete a day.



State, County and City highway and street departments use all sizes of "PAYLOADER" tractor-shovels for all kinds of earth-moving and material-handling work.

WHETHER you're a contractor or a public works official a "PAYLOADER" tractor-shovel can help you solve more earth-moving and material-handling jobs than you can imagine. Thousands of them have proven it with millions of hours of accumulated work time.

A "PAYLOADER" is so versatile that it is a "year 'round producer" — digs, grades, spreads, piles and loads dirt — handles materials, and plows and loads snow. A variety of extra attachments are also available to handle many other special jobs.

There's a size and model of "PAYLOADER" to fit your needs . . . bucket capacities from 12 cu. ft. to 2 cu. yd. . . . four-wheel-drive types, front-wheel and rear-wheel drive types. Every "PAYLOADER" model is a *proven* machine — built by Hough, the pioneer and leader in tractor-shovel development — sold and serviced by outstanding Distributors. *Your* Hough Distributor will be glad to demonstrate what a "PAYLOADER" will do for you. The Frank G. Hough Co., 761 Sunnyside Ave., Libertyville, Illinois.

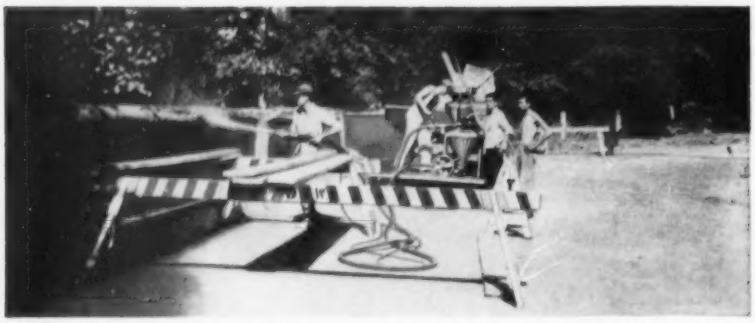
PAYLOADER®

THE FRANK G. HOUGH CO. • LIBERTYVILLE, ILL.

SUBSIDIARY—INTERNATIONAL HARVESTER COMPANY

Now's the time to mail this month's Readers' Service card

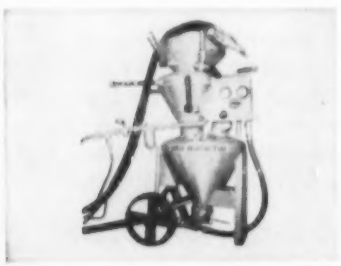
City-Owned Portable Rig Guns Concrete at Low Cost



● THE CITY OF SYRACUSE, N. Y., moves its Bondactor quickly and easily from one concrete restoration project to another on the portable rig shown here on the job.

● BEFORE RESTORATION with Bondactor equipment, a wire mesh support for the gunned concrete was set in this badly deteriorated retaining wall.

● AFTER GUNNING with the Bondactor rig that was moved easily along as the job progressed, the wall is completely restored.



● LOW-COST, EASIER, BETTER MAINTENANCE is possible by solving all your concrete restoration problems with Bondactor concrete gunning equipment.

THE department of public works in the city of Syracuse, N. Y., has found a smart, money-saving answer to their concrete restoration problems. They mounted Bondactor gunning equipment on a portable rig with a mixer and compressor. In 1953, this equipment paid off on 30 major jobs, such as restoring walls, sidewalks, curbs and streets.

Permanent Restorations At Lower Cost

The city has found that gunning with a Bondactor actually cuts down on restoration work because it does a permanent job. The dense surface bonds to the base masonry and forms a permanent water and acid resisting build-up which increases both tensile and compression strength. And . . . because it is faster and requires less labor and materials than inferior substitute methods . . . efficient Bondactor methods cut costs, not only for concrete restoration but for fire-proofing, wet and dry sandblasting and many other operations.

Send in Your Problems

For complete information on how Bondactor equipment can stretch your maintenance budget just like Syracuse has done, send in your problems today by letter, phone or wire. Simply state intended uses and materials to be gunned. Air Placement Equipment Company, 1013 West 24th Street, Kansas City 8, Missouri.

of the Portland Cement Association, with offices at 33 W. Grand Ave., in Chicago. Joe and his boys are still very busy—promoting their material for use in roads, streets, airfields, etc. About a half million square yards of soil-cement will be built this year. Walked into the office of *Better Roads* unannounced, hoping to chat with Charley Nelson, an old friend, only to learn of his tragic and untimely death from a cerebral hemorrhage on September 2. A wonderful person and a staunch advocate of improved local roads, Charley will be missed by his friends in the highway business for a long time to come. We didn't get to attend the National Conference of County Engineers and Officials in Columbus, Ohio in September, but they tell me it was a big success.

Round and About — The Department of Traffic of the City of New York has announced that a hot-melt plastic compound — Veon — will be used to mark school crosswalks at 1200 locations in the West Bronx and Manhattan's East Side. The State Highway Study Commission of Minnesota has received plans from two outside agencies (Automotive Safety Foundation and the Public Administration Service) for a ten-year program of improvement for the state's 121,000 miles of roads and streets; estimated cost, $152 million a year, possibly to be financed by a two-cent increase in the state gasoline tax. A new edition of the *Geometric Design Policies* of the American Association of State Highway Officials will be off the press very shortly. Two new publications of the National Highway Users Conference focus attention on highway finance—they are "State Constitutional Limits on Borrowing" and "Sales and Use Taxes and Similar Taxes Affecting Motor Vehicles." Lou Goodman, formerly at Lehigh, has been named Associate Professor of Civil Engineering at Syracuse University; he'll handle soil mechanics and transportation.

• • •

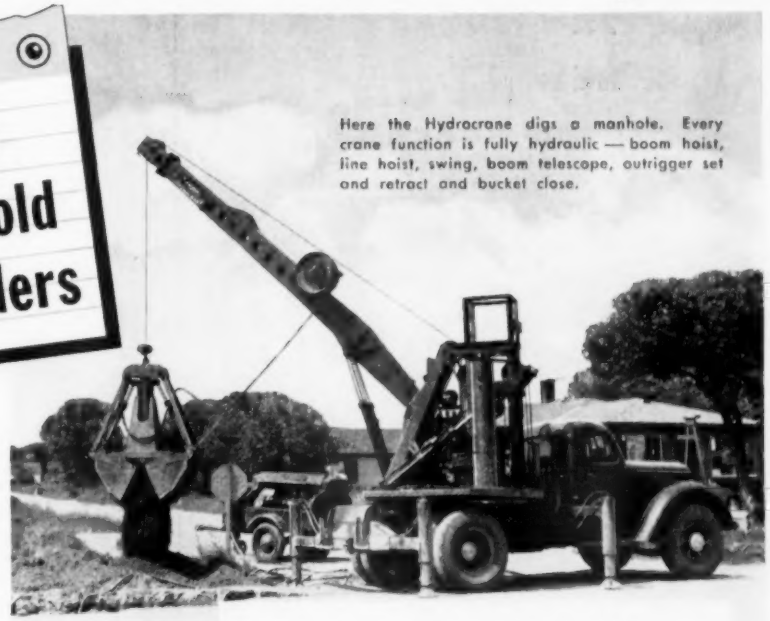
Toll Charges on New York Thruway

The New York Thruway Authority has announced the schedule of tolls for the section of the highway opened in 1954. They approximate 1.25 cents per mile for passenger cars and range from 1.75 cents to 5 cents per mile for various sizes of trucks. The rate for buses is 3.50 cents per mile.

Those Who Use It... Choose It Again

MEMO

38.6% of all Hydrocranes Sold are Repeat Orders



Here the Hydrocrane digs a manhole. Every crane function is fully hydraulic — boom hoist, line hoist, swing, boom telescope, outrigger set and retract and bucket close.

Yes, 38.6 per cent of all Hydrocranes sold are additional machines bought by satisfied users. In fact, many owners are now fleet operators — buying a 3rd, 4th, 5th and even a 6th Hydrocrane! Here's real proof that this all-hydraulic truck crane produces big, gives owners an extra profit pay-off.

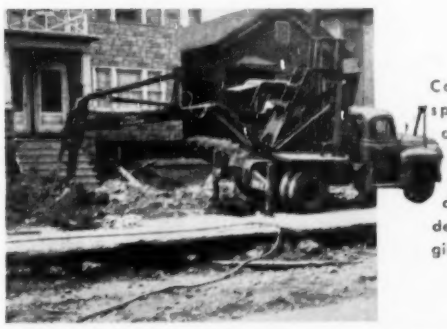
Only Hydrocrane gives you all these:

- ★ **"Reach-ability" with hydraulically telescoping boom.**
- ★ **Maneuverability with extremely short tail swing, low over-all height.**
- ★ **Stability with four hydraulically controlled outriggers.**
- ★ **Mobility with speeds up to 50 mph.**
- ★ **"Control-ability" with full hydraulic, finger tip control.**
- ★ **Convertibility — quickly changed to dragshovel front end in the field.**

Plus More for '54.

- ★ **Self-power — Hydrocrane has its own independent power unit. (optional)**
- ★ **Remote control — start it, drive it, turn it, stop it right from the crane cab. (optional)**
- ★ **Selector unit — foot control channels *extra* hydraulic fluid to line hoist bank— gives you 50% faster line speed. (optional)**
- ★ **Increased line speeds — even without selector valve unit, all line speeds are now 10% faster.**
- ★ **New pressure head — provides even better control of hydraulic pressure.**
- ★ **Increased crane rating — maximum capacity now 4-ton with two-part hoist.**
- ★ **Wrist-action dipper — makes Hydrohoe the only dragshovel with a triple action digging force . . . permits operator to vary dipper's digging postion.**

Arrange a demonstration now!



Compact Hydrohoe speeds trench job on city street. New wrist-action dipper provides variable digging angles . . . delivers extra digging power.

BUCYRUS-ERIE COMPANY
South Milwaukee, Wisconsin

Gentlemen:

Please send literature on

- ☐ self-powered and standard Hydrocrane
- ☐ self-powered and standard Hydrohoe
- ☐ remote control Hydrocrane-Hydrohoe
- ☐ wrist-action dipper
- ☐ I am interested in a demonstration

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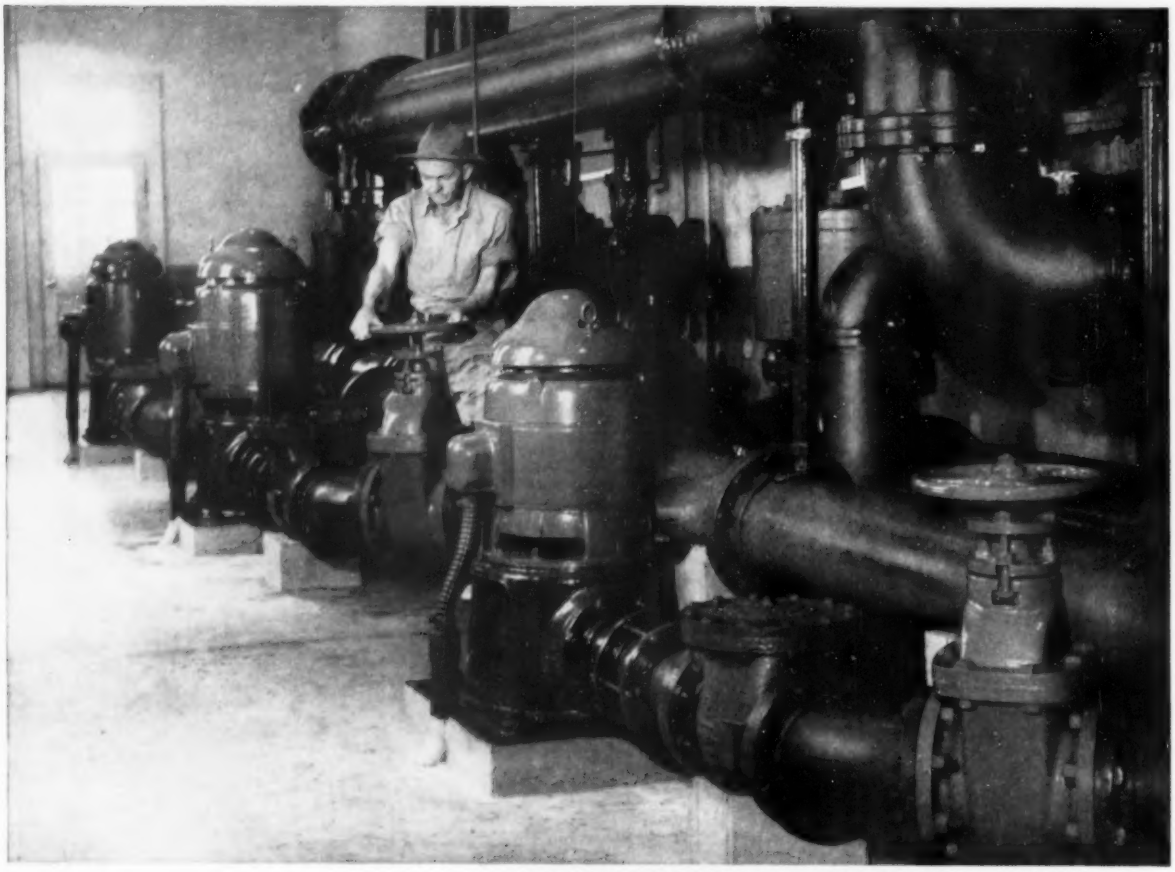

THREE WORTHINGTON VERTICAL TURBINE PUMPS lift water 66 feet in the dual-purpose water treatment plant in Pulaski, Virginia.

Pulaski's new plant softens hard water, hardens soft water

Seems that the main source of water for Pulaski, Virginia, is a small impounding reservoir where the water is extremely soft.

When the reservoir runs low, Pulaski draws from a limestone spring. Water here is unusually hard.

To deliver water of uniform quality all year 'round, the Pulaski plant has to soften the hard water — and harden the soft water.

Pumps for this unique plant were supplied by Worthington. Three Worthington vertical turbine units transfer water from the plant's clear well to the general distribution system. Pulaski's engineers are well pleased with the Worthingtons because they take up so little floor space and need no priming facilities or foot valves. The three pumps are installed in a 16-foot deep clear well and lift water 66 feet at exceptionally high pumping efficiencies.

Why not learn how the modern Worthington vertical turbine pump can help in your operation? Write for free Bulletin W-450-B40 to Worthington Corporation, Vertical Turbine Pump Division, Harrison, New Jersey. D.4.28

WORTHINGTON

THE WORLD'S BROADEST LINE ASSURES YOU THE RIGHT PUMP FOR EVERY JOB

CENTRIFUGAL • ROTARY • STEAM • POWER • VERTICAL TURBINE

CONSERVE GROUND WATER—IT IS A VALUABLE RESOURCE

Now's the time to mail this month's Readers' Service card.

POPLAR BLUFF — Kinzer Street, built in 1922. Photos taken in 1923 and 1952.

CENTRALIA — Allen St. built in 1924. Photos taken 1925 and 1952.

Here today – *and still here tomorrow*

that's the story of Missouri's CONCRETE STREETS

These are photos of a few old streets that have answered Missouri's challenge of "show me." They demonstrate the durability, economy and dependability of concrete streets. Missouri's taxpayers and city officials can be proud of the record of their concrete pavements.

Long service at low annual cost is typical of concrete pavement. And today, because of improvements in engineering design, materials and construction methods, concrete pavements can be built to last 50 years and more.

Concrete is the safest pavement too. Its gritty, skid-resistant surface permits *quick* stops—wet or dry. Its light color provides maximum visibility at night. Remember, *if you can't see you can't be safe!*

For more information about designing and building durable, safe, low-annual-cost concrete pavement write for free literature, distributed only in the U.S. and Canada.

PORTLAND CEMENT ASSOCIATION

A national organization to improve and extend the uses of portland cement and concrete...through scientific research and engineering field work

Dept. 11-89, 33 West Grand Avenue, Chicago 10, Illinois

SPRINGFIELD — Delmar St. Built 1926. Photos taken 1927 and 1952.

CAPE GIRARDEAU — Mill Street, built in 1926. Photos taken in 1929 and 1952.

FREE EQUIPMENT DATA to Help Your PUBLIC WORKS PROGRAM

NEW LISTINGS

The engineering information in these helpful catalogs will aid you in your Engineering and Public Works programs. Just circle numbers you want on the coupon, sign and mail. This free Readers' Service is restricted to those actively engaged in the public works field.

How to Select Paints For Every Maintenance Need

253. Selecting the right paint for each maintenance need involves consideration of the service to be rendered, conditions of their use and abuse, and the surfaces to which they are to be applied. To help you determine what to use on various surfaces, an industrial paint index printed in the form of a handy file folder has been prepared by the Tropical Paint and Oil Co., Cleveland 2, Ohio. Get a copy by checking the coupon.

Four Jobs: One Attachment With Four-in-One Skid-Shovel

284. Bulldozing, grading and spreading; Bullclam shovel, skid-shovel and clamshell actions are all built into the exclusive Four-in-One skid-shovel attachment introduced by the Drott Mfg. Co., Milwaukee 8, Wis. for use with International TD-6 and TD-9 crawler tractors. Outstanding features are the pry-action break-out which uses leverage for bigger lifts; shoe transportation for skidding bigger loads; closed hydraulic system; and the Hydro-Spring that absorbs hydraulic shocks. You'll want all the details—get them by checking the coupon.

Better Field Testing for Highway Foundations

313. A new soil testing device for making field density and moisture tests is suitable for use in all soils, including fine, coarse, granular base and gravel. Called the Washington Densometer, it features unexcelled accuracy, completes tests in 3 minutes, is light weight, compact and economical to operate. Get further details from Charles R. Watts & Co., 4121 Sixth Ave. NW, Seattle 7, Wash. by checking the coupon.

Engineering Data On Pressure Filter Design

329. A comprehensive bulletin describing Permutit's extensive line of pressure filters and their accessories is now available from The Permutit Co., 330 West 42nd St., New York 36, N. Y. Specifications, operating characteristics, outline dimensions and typical installation photographs are included in this 16-page publication. Get Bulletin 2225B by checking the coupon.

Quick Review of Measuring and Control Equipment

113. Short descriptions and characteristics of various types of measuring and control equipment for water and sewage applications are provided in 4-page Bulletin 050 prepared by Simplex Valve & Meter Co., 68th and Upland Sts., Philadelphia 42, Pa. Check the coupon.

Refuse Transfer Stations Provide Sanitary Storage

146. Assistance in planning your requirements for transfer storage of refuse is offered in an attractive new brochure published by the American Sanitary Storage and Transfer Co., Box 56, Springfield, Ill. See how your community can increase collection efficiencies and reduce hauling costs by establishing nuisance-free, prefabricated storage units at appropriate sites. Check the coupon for this interesting bulletin.

Lightweight Drill Aids Soil Sampling

228. Two Acker core drills, models LD and LLD, are described in Bulletin No. 21 recently made available by the Acker Drill Co., 725 W. Lackawanna Ave., Scranton, Pa. Used for cutting highway test cores, soil samples, drainage holes and for foundation test drilling, these machines are designed for fast and economical operation. Get the details by checking the coupon.

Helpful Data on Reflective Traffic Paint

344. New literature on Cataline Premix Compound and Cataline Beads-on-Paint Combination, including information on application methods, drying time, units of sale and prices per gallon is offered by the Cataphote Corp., Toledo 10, Ohio. Get this helpful data by checking the coupon.

Activated Safety Signals Command Driver Attention

322. A complete line of activated safety warning signals designed to increase driver obedience is described in literature of the Winko-Matic Signal Co., 750 Broadway, Lorain, Ohio. Each unit provides two alternately flashing lights. Time clock attachments may be added for school crossing signs. For full data check the coupon.

Backhoe Attachment Available For the Hough "Payloader"

323. Increased utility and versatility for the Payloader is provided by the recently introduced Wain-Roy backhoe, a unit designed specifically for combination with Payloader Models HE and HF. Actuated bucket with wrist action, speedy, simple hydraulic control, wide working range and high dumping reach are among the unit's special features. Boom design and mounting permits cutting vertical walls, square corners and smooth level grades. Get further details from Wain-Roy Corp., Hubbardston, Mass. by checking the coupon.

FOR MORE LISTINGS SEE PAGES 34 TO 51

Get Full Data On the Radar Speed Meter

22. Accurate readings of vehicle speeds, with direct indications in miles per hour and a graphic recorder for permanent record are available by use of the Electro-Matic Radar speed meter, a product of Automatic Signal Division, Eastern Industries Inc., Norwalk, Conn. For full data on this device, just check the coupon.

Booklet Tells How to Tap Concrete Pressure Pipe

336. A handy, pocket sized fully illustrated manual that shows how to make large taps or small service connections under pressure has been published by Price Brothers Co., 1932 E. Monument Ave., Dayton 1, Ohio. Photos and step-by-step instructions show how to do the job quickly and at minimum cost. For your copy just check the coupon.

Effective Safety Lighting for Work Area Protection

324. Basic principles for day and night protection of work areas where traffic and other hazards are present is presented in literature of the John A. McDermott Corp., 40-22 National St., Corona, N. Y. Both temporary interruptions and extensive construction are considered in the recommended patterns for flashing warning lights of all types. Check the coupon today.

11-54

USE THIS COUPON to get detailed information on products and materials mentioned in this issue. Circle numbers below and mail today.

STOP READ AND SEND

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New Products, pages 138 to 143:

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NOT GOOD AFTER DEC. 15, 1954 MAIL THIS CARD NOW

1 yd. Jaeger Load-Plus easily loads biggest trucks

This loader gets its chin up

Higher: 8'2" under lip, 10'4" under hinge
Farther: 24" reach — Faster: in only 4½ seconds

Count how many times a day a loader dumps. That's the multiple of the time saved with this high-reaching, fast-dumping Jaeger Load-Plus. By every measurement of clearance, reach, hoisting speed and clean dumping action it out-performs and out-produces any other loader in its class.

From "carry" position it takes only 4½ seconds to reach maximum dumping height. Trigger-fast bucket control is provided by a separate hydraulic pump and double-acting rams. The large capacity of this pump enables your operator to control bucket loads up to 5000 lbs. with finger-tip ease, dump fast or slow, and place loads anywhere he wants them.

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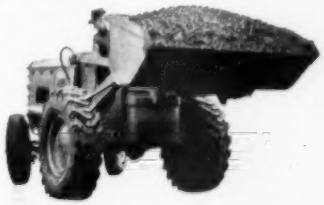
Load increases traction because it's centered on the driven front wheels. Hoisting crowds bucket 13" deeper into pile.



Turns in only 14 ft. radius with power-steered rear axle. 5 speeds to 28.2 mph reverse, 18.7 forward.

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NEW LISTINGS (Continued)

Bulletin Helps Specify A.W.W.A. Gate Valves

79. Double disc gate valves in 2" to 60" sizes are fully described in a 16-page bulletin which gives details on valve parts, design, materials, application of the "O" Ring Seal, operation and operating devices, directions for ordering valves and parts, dimensions of all sizes, and descriptions of eleven different methods for end connections. Valves for horizontal operation, square bottom valves, many types of gearing and gear cases, and a complete listing of special controls available are included. Get Bulletin A from Rensselaer Valve Co., Troy, N. Y. by checking the coupon.

What You Should Know About Reflective Markings

250. The story of reflective markings for maximum safety on highways and municipal streets and better visibility of signs is told by the makers of Prismo reflective materials and equipment in an attractive 20-page catalog. Pioneering development of the Prismo process, continued laboratory control and successful use over many years backs up the detailed descriptions of materials and methods for reflectorizing traffic lines and signs of all kinds. For your copy write Prismo Safety Corp., Huntingdon, Pa. or check the coupon.

Self Loader for Trucks Is Municipal Workhorse

337. Any conventional 2-ton dump truck can be converted to a multi-purpose machine with the LoDal hydraulic truck self loader, the versatile device manufactured by LoDal., Inc., Norway, Mich. To supplement the basic machine, quick changeovers can be made to a pickup sweeper which dumps accumulated debris into the truck; to a heavy duty snow plow or snow removal unit; or to a special combination for refuse collection. All the facts in profusely illustrated Catalog No. 11B, available by checking the coupon.

Book Offers Help in Using Sewage Plant Gas

223. Means for the maximum utilization of gas generated in sewage plant operation are discussed in 20-page Bulletin C-5200 entitled "Rockwell Products for Sewage Disposal Plants," which is offered by the Meter and Valve Div., Rockwell Mfg. Co., 400 No. Lexington Ave., Pittsburgh 8, Pa. Full data on sewage gas meters, regulators and valves are included in this helpful bulletin. For your copy just check the coupon.

Latest Data on Prestressed Concrete Lighting Standards

265. Comprehensive data on prestressed concrete standards for street and highway lighting is contained in a 24-page catalog which contains complete engineering tables and descriptive information on design features, mounting arrangements, base type choices and specifications of Hy-Lite standards. Get helpful and easy-to-read Catalog No. 300 by writing to American Concrete Corp., 5092 No. Kimberly Ave., Chicago 30, Ill., or check the coupon.

Handbook Covers All Soil Test Apparatus

24. Over 800 items of apparatus for engineering tests of soils, concrete and bituminous materials are described and illustrated in a new 72-page catalog published by Soiltest, Inc., 4520 W. North Ave., Chicago 39, Ill. All standard apparatus for field and laboratory engineering tests of soils are included. Get Catalog 53 by checking the coupon.

Excellent Booklet Shows Aerial Mapping Technique

26. A clear explanation of the technique of aerial topographic map production is given in "Focusing on Facts". Striking photographs trace aerial photographs to final maps for highway planning, detailed city photomaps, reservoir surveys and many other applications. An excellent guide for public works and planning officials. Use coupon or write Fairchild Aerial Surveys, Inc., 224 E. 11th St., Los Angeles 15, Calif.

Safe Ground-Level Luminaire Maintenance

127. Reduced servicing costs and safe ground-level maintenance of luminaires is described in a bulletin featuring four "Servisafe" models for single or double arm metal poles, single arm wall brackets and single arm brackets for wood poles. Be sure to investigate the patented disconnecting and lowering hanger mechanism which is the key to "Servisafe" performance. Get Bulletin WPH-54 from Thompson Electric Co., 1117 Power Ave., Cleveland 14, Ohio. Check the coupon.

●

WATER WORKS

Efficient Coagulation With Ferri-Floc

69. Advantages claimed for Ferri-Floc as a coagulant include wide pH range, quick floc formation, manganese removal, control of certain tastes and odors, plus other aids in high quality water production. Check coupon for complete Ferri-Floc data. Tennessee Corp., Grant Bldg., Atlanta, Ga.

96 Page Book Helps Solve Water Problems

71. pH and Chlorine Control. A discussion of pH control and description of comparators, colorimeters and similar devices. A 96 page booklet. W. A. Taylor & Co., 7304 York Road, Baltimore 4, Md.

Theory and Application Of the Flow Tube

84. Hydraulic formulae, head capacity curves and test data for this primary metering element are given in a technical bulletin, "Theory and Application of the Flow Tube," available from Foster Engineering Co., Union, N. J. Check the coupon for a copy.

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Data on Cutting-In Valves, Repair Sleeves and Accessories

33. A variety of Clow products for installation and repair of cast iron pipe lines, including the Eddy cutting-in valve and sleeve, split sleeves for pipe repair, test plugs, valve boxes, Strickler pipe cutters and other fittings and accessories are featured in literature available from James B. Clow & Sons, Inc., Box 6600-A, Chicago 80, Ill. Check the coupon.

Technical Data on Fluorides And Other Chemicals

48. Technical data on fluorides and other chemicals will be found in a comprehensive booklet issued by Blockson Chemical Co., Joliet, Ill. This helpful 60-page booklet includes a great deal of general information of value to water works men. Get a copy by checking the coupon.

Helpful Data on Water Works Products

49. A completely new catalog covering the entire line of water distribution and service products offered by the Mueller Company, of Decatur Ill., is now available to engineers and water works superintendents. The 328-page catalog features an easy-to-use sectional indexing arrangement to facilitate quick reference to any of the hundreds of products listed. A large section of useful engineering information is included. Check the coupon today.

Graver Reactivator Package Water Treatment Plant

58. Specially designed "package" plants for treating up to 2 MGD are described in literature of the Graver Water Conditioning Co., 216 W. 14th St., New York, N. Y. All necessary components are contained, including chemical feeders, Reactivators, filters, piping, valves, controllers and accessories. For full data check the coupon or write to the manufacturer.

Meter Features That Help Make Water Works Profitable

59. Simple design, accuracy and long life, moderate first cost and inexpensive maintenance are features of American water meters described in Bulletin No. 50 of the Buffalo Meter Co., 2917 Main St., Buffalo 14, N. Y. Be sure you have this informative booklet which gives the details of American meter design and construction plus full data on sizes, capacities and dimensions. Get your copy by checking the coupon.

Design Data on Chemical Flocculating Equipment

89. Flash mixers, Straightline mixers, conveyors and elevators for handling chemicals are described in illustrated Bulletin No. 2442 available from Link-Belt Co., Colmar, Pa. Selection tables and diagrams are provided to help you select the equipment best suited to your needs. Check the coupon for your copy.

Useful Data on Butterfly Valves

100. Complete descriptions and tables of dimensions on the full line of Rockwell Butterfly Valves is contained in several bulletins published by the company. Construction details and special control features are illustrated. Write W. S. Rockwell Co., Eliot Street, Fairfield, Conn.

Specs for Gate Valves

112. Rigidly inspected gate valves for pressures up to 175 lbs. by R. D. Wood Co. Sizes 2" to 30"; for any standard type joint. R. D. Wood Co., Public Ledger Bldg., Philadelphia 5, Pa.

Makes Underground Pipe Installation Easy

115. One-man operated hydraulic pipe pusher pushes pipe through ground under streets, sidewalks, lawns and other obstacles. Pays for itself in man hours saved on first few jobs. For complete facts ask for Form E-213, Greenlee Tool Co., Rockford, Ill. Just check the coupon.

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Discussion of Ranney Method For Municipal Water Production

116. A very interesting study of municipal and industrial water supply problems and a complete discussion of Ranney Collectors for water production will be found in a 20-page booklet published by Ranney Method Water Supplies, Inc., Box 277, Columbus 9, Ohio. Water quality, construction methods, costs, performance and other topics are considered. Check the coupon to get your copy.

Vertical Turbine Pumps For Municipal Water Supply

121. Engineering data on vertical turbine pumps for deep or shallow well operation in capacities ranging from 50 to 10,000 gallons per minute, oil or water lubricated, are covered in a booklet issued by Worthington Corp., Vertical Turbine Division, Succasunna, N. J. Check the coupon today for this helpful information.

How Engineers and Contractors Can Get This Comprehensive Water Control Apparatus Catalog

141. A 250-page catalog showng the full scope of Rodney Hunt water control apparatus is now available for distribution to consulting engineers, contractors and others actively engaged in water control construction work. Hundreds of diagrams, detailed descriptions and specifications show all types of sluice gates and related items, and a special section provides helpful engineering data. Send your request on business letterhead or use the coupon, stating your occupation. Rodney Hunt Machine Co., 7 Water St., Orange, Mass.

Faster Pipe Laying With Precaulked and Threaded Joints

148. McWane 2" cast iron water pipe with threaded joints and precaulked bell and spigot pipe are described in folder WM-47. Additional data on 3" to 12" centrifugally cast pipe and fittings in folder WL-47, both issued by McWane Cast Iron Pipe Co., Birmingham 2, Ala.

What You Should Know About Fluoridation and Fluoridators

155. Two helpful publications issued by Wallace & Tiernan titled "Fluoridation" and "Fluoridators" show the development of fluoridation, list the chemicals and dosage normally used, and give full technical data on solution feed and dry feed fluoridators. Be sure to get these publications from Wallace & Tiernan by checking the coupon today.

Helpful Data on Sluice Gates

158. In a well-organized 48-page catalog you will find complete engineering and design data on Pekrul sluice gates, headgates, automatic flap gates, lifts and accessories. Numerous models in 6" to 92" sizes are available, and all pertinent data will be found in this helpful booklet. Write Morse Bros. Machinery Co., Denver, Colo., or use the coupon.

Pipe Joint Essentials and Couplings for Every Job

168. Superior pipe joints are tight, flexible, simple, strong and economical. Dresser's handsome 34-page bulletin No. 513 shows how these essentials are met and provides layouts for curves, working pressures and a wealth of other data. Be sure to check this bulletin on the coupon. Dresser Mfg. Div., 59 Fisher Ave., Bradford, Pa.

Get This Helpful Data On Valve Boxes

187. Full details on service, roadway and valve boxes, meter boxes, frames and covers are included in Bulletin 2000 issued by Alabama Pipe Co., Anniston, Ala. All standard sizes are listed, together with prices, and instructions are furnished for handling special designs. Check the coupon for your copy.

Water Lines Under Pavements Easily Installed

247. With a Trojan pipe pusher and puller no resetting of grip is required, so the work goes twice as fast. Two models, for pipe up to 2" dia. Get full details by checking the coupon. Trojan Mfg. Co., 1114 Race Dr., Troy, Ohio.

Pipe Detector Determines Exact Location and Depth

120. Determination of the exact location and depth of buried pipes, valves, service cables and other metallic objects can save costly digging and unnecessary damage. Your work can be speeded when you use the Detectron pipe detector, which features simple operation, shielding to avoid static interference, economical unit construction and a lifetime guarantee. Get full data from Detectron Co., 5631 Cahuenga Blvd., No. Hollywood, Calif., by using the coupon.

Assistance in Planning Electrical Systems

189. On every water and sewage plant expanston, modernization or new construction job, you can get valuable assistance in planning the electrical system from Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa. Be sure to investigate compact, unitized Westinghouse equipment which conserves building space and simplifies maintenance. Check the coupon for full data.

Engineering Data on Tilting Disc Check Valves

196. The Chapman tilting disc check valve is designed to lift away from the body seat without sliding or wearing; closes without slamming. Operating principles, details of construction, dimensions, recommendations and engineering data are fully covered in 18-page Bulletin No. 30. Get your copy by checking the coupon or write to Chapman Valve Mfg. Co., Indian Orchard, Mass.

Complete Catalog and Reference Data on Valves and Fittings

211. The entire M & H line of valves, fittings and accessories for water works, filtration sewage disposal and fire protection are illustrated and fully detailed in Catalog 52 issued by M & H Valve & Fittings Co., Anniston, Ala. In addition to complete data on these products, there are many pages devoted to helpful engineering data. Every designer should have a copy. Get yours by checking the coupon.

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Helpful Data On Pipe Tools

230. Toledo drop head ratchet threaders are light, compact, ideally suited for work in tight corners. Three models for ⅛" to ¾"; ⅛" to 1¼"; and ½" to 2" pipe all feature quick change of sizes. Get Catalog 12A53 from Toledo Pipe Threading Machine Co., Toledo, Ohio. Check the coupon.

Attractive Bulletin Features Large Elevated Tanks

252. In a 24-page booklet, "Horton Elevated Steel Tanks of Large Capacity," Chicago Bridge & Iron Co., Chicago 4, Ill., describes the advantages of using large elevated steel tanks to provide gravity pressure in municipal water systems. Detailed information on radial-cone tanks of 500,000 to 3,000,000-gal. capacity and Horton-spheroidal tanks of 1,000,000 to 3,000,000 gal. is included in this really handsome bulletin. Check coupon for your copy.

Automatic Proportioning Unit For F&P Chlorinator

376. Automatic adjustment of chlorine feed to proportion of main line flow rate is accomplished by the Fischer & Porter Automatic Proportioner, described and illustrated in Catalog 70-20 of Fischer & Porter Co., Hatboro, Pa. Available by checking the coupon.

Helpful Data on Butterfly Valves

238. A comprehensive catalog which furnishes full data on the design and application of Pratt Rubber Seat Butterfly Valves has been made available to designers and engineers by Henry Pratt Co., 2222 So. Halsted St., Chicago 8, Ill. Check the coupon for your copy of this excellent source of practical information.

How to Compute Quantities of Jointing Materials

271. A helpful table for determining quantities of "Tegul-Mineralead" required, using jute or "Hyde-Ro Rings", plus complete answers to your questions on sulfur compound jointing materials will be found in Bulletin M-10 issued by Atlas Mineral Products Co., Mertztown, Pa. Check the handy coupon today.

Standard Specifications for C. I. Pipe and Fittings

278. Standard dimensions for cast iron water pipe and special castings are available in a convenient booklet offered with the compliments of U. S. Pipe and Foundry Co., Birmingham 2, Ala. Get your copy by checking the coupon.

Technical Bulletin on Solenoid Operated Valves

288. Full technical data on application, construction, dimensions and specifications of Golden-Anderson Cushioned solenoid operated valves is contained in Bulletin W-7, available from Golden-Anderson Valve Specialty Co., 1232 Ridge Ave., Pittsburgh, Pa. Selected valve patterns are offered in ½ to 2-in. and 2½ to 36-in. sizes. Get all the details; just check the coupon.

Instrumentation and Control Equipment For Water and Sewage Plants

298. Full engineering data on the instrumentation and control equipment needed in water works, sewage plants, pumping station and related installations are provided in the "Application Engineering Data" binder issued by the Foxboro Co., Foxboro, Mass. Every engineer and designer should have this valuable material on hand. Check the coupon if you can use this data.

Factors to Consider in Elevated Tank Selection

299 Details on the several different types of elevated steel tanks, including capacity ranges, tank dimensions and other factors to be considered in the selection of elevated tanks for modern water storage, plus discussions of new tanks for old towers and foundations are included in Bulletin 101 of the Pittsburgh-Des Moines Steel Co., Neville Island, Pittsburgh, Pa. Check coupon for your copy.

To order these helpful booklets check the coupon on page 32.

Trencher Fits Municipal Needs

315. A bulletin describing the Cleveland Model 95 trencher has been published by the Cleveland Trencher Co., Cleveland 17, Ohio. The Model 95, called "The standard machine for city and suburban work", is versatile, maneuverable and economical for use on water lines, service lines, road widening and all utilities trenching. Get this 8-page illustrated bulletin by checking the coupon.

Helpful Data on Water Meters

330. It is to the interest of every water works superintendent and engineer to have full data on dependable Badger water meters and related meter products. Complete data on all types of disc, turbine and compound meters, meter test equipment, yokes, strainers and alarm registers are supplied in an attractive binder by Badger Meter Mfg. Co., Milwaukee 45, Wis. Check the coupon for your copy.

Engineering Data on Lubricated Plug Valves

355. Full information on Homestead lubricated plug valves in full-port and venturi types, sizes up to 14", and with a choice of self-seald two-piece plug or one-piece plug designs. Engineering information includes principal dimensions, types of control, metals, lubricants, etc. For your copy write Homestead Valve Mfg. Co., Coraopolis, Pa., or check the coupon.

Automatic Cutter Saws Cast Iron Pipe

393. This portable automatic pipe saw, available with either pneumatic or electric drive, makes fast precision cuts in 8-in. to 60-in. cast iron or steel pipe. Features are light weight, minimum clearance required, easy operation even when submerged. Get details from H. R. Prescott & Sons, Inc., Worcester, Mass., by checking the coupon.

Restoration and Protection Of Concrete Structures

385. A "How to Do It" bulletin describing the Thoro System for repair and sealing interior and exterior masonry surfaces is available from Standard Dry Wall Products, Inc., New Eagle, Pa.. The treatment for every water problem is presented in illustrated case histories in this useful publication. Check the coupon for your copy.

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SEWERAGE AND WASTE TREATMENT

What You Should Know About Trickling Filter Underdrains

20. Specifications for vitrified clay underdrain blocks conforming to ASTM standards, suggestions for layout and construction of trickling filter floors, dimensions of standard blocks, channel covers, angles and other fittings are available from the Trickling Filter Floor Institute, c/o Editor, Public Works, 310 E. 45th St., New York 17, N. Y. Check the coupon and we will forward your request.

How Cities Clean Sewer Lines From Street in One Operation

25. In a helpful 28-page handbook of sewer cleaning methods and equipment the makers of OK Champion sewer cleaners give 'ull' details of power and hand operated models. Also included are data on expansion buckets that take dirt from sewer to street in one operation, root cutters and other accessories. Get your copy by checking coupon. Champion Corp., 4752 Sheffield Ave., Hammond, Ind.

A Handbook of Sewer Cleaning Methods and Materials

44. Complete, easy-to-follow directions for every type of sewer cleaning operations and the equipment needed for effective cleaning work is covered in a 40-page booklet issued by Flexible Sales Corp., 3786 Durango, Los Angeles 34, Calif. Full details are provided on power cleaning machines, the SeweRodeR, hand tools and all accessories. Water main and culvert cleaning methods are included. Check the coupon for your copy of this helpful handbook.

Useful Design Data On Clarifiers

65. Designers and engineers will find a wealth of helpful information on Dorr Clarifiers for water, sewage and industrial waste treatment in an attractive bulletin issued by the Dorr Co., Stamford, Conn. Units for round and square tanks in diameters from 12 to 200 ft. are fully specified and illustrated. Check the coupon for your copy.

Theory of Controlled Digestion With Floating Cover Tanks

88. In an excellent 40-page booklet, an authoritative discussion of digestion theory and practices, including design, operation and economics is presented by the Pacific Flush Tank Co., Chicago 13, Ill. Complete data are given on the use of floating covers, together with details on tank construction, piping and control chambers. Requests for this valuable booklet must be made on business letterhead.

What You Should Know About Design and Use of Concrete Sewers

122. Every engineer and contractor should have a copy of the 48-page book "Concrete Sewers" in his library. This valuable text, published by the Portland Cement Assn., 33 W. Grand Ave., Chicago 33, Ill., gives an authoritative discussion of hydraulics, sewer design, construction and maintenance. Generous use of helpful illustrations makes the book attractive and helpful to the reader. For your copy, just check the handy coupon.

Technical Data Offered on The "Barminutor"

156. The Chicago Pump "Barminutor" which combines a bar screen with a vertically traveling Comminutor unit is now available for flows of 15 MGD and over. Units are readily installed in existing open channels. Get full technical data from the Chicago Pump Co., 622 Diversey Pkwy, Chicago 14, Ill.

A Short Course In Pipe Jointing

169. The story of rubber couplings for clay and concrete pipelines is graphically presented in the booklet "Pipe Enterprise", published by Hamilton Kent Mfg. Co., Kent, Ohio. Detailed description of pipe jointing methods, photos showing jobs where Tylox gaskets met the need for easily assembled, permanently tight joints installed under all conditions; and a report on the development, manufacture and outstanding features of the compression type gasket make this booklet valuable to every engineer and contractor. Check the coupon for free copy.

Factors in Selecting Chlorine Gas Feeders for Sewage Chlorination

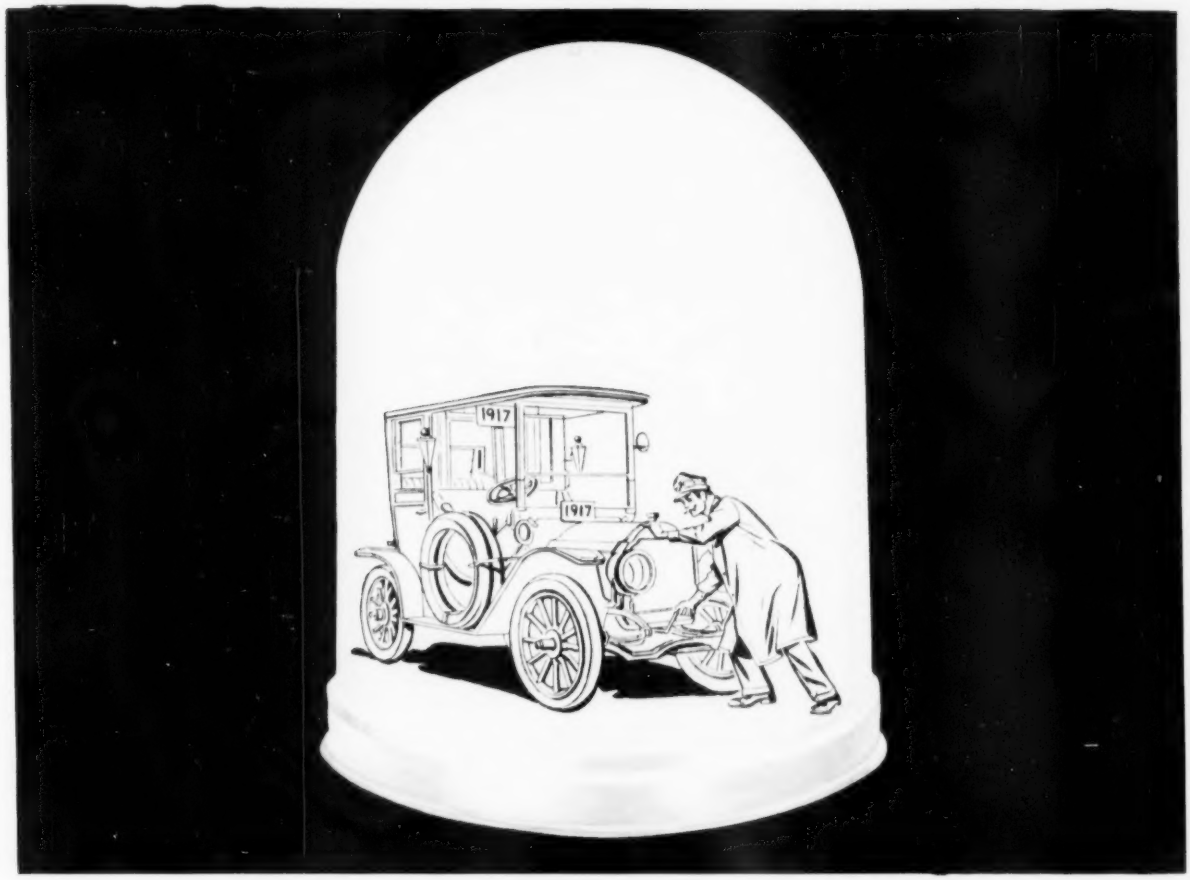
181. A technical data sheet, number 840-J37, has been prepared as a guide in the application of chlorine for sewage treatment. The purposes of sewage chlorination, types of chlorination, points of application, control methods, types of feed and feeders and equipment location are discussed. Check the coupon or write to Builders-Providence, Inc., 345 Harris Ave., Providence, R. I.

Complete Catalog for Engineers Shows Water and Sewage Plant Equipment

191. The complete line of Jeffrey equipment for treatment of water, sewage and industrial wastes is covered in 52-page Catalog 833-A. Detailed information is provided on bar screens, grinders, grit collectors, "Jigrit" washers, sludge collectors, feeders, conveyors and other related units. Photos and drawings of installations plus capacity tables complete this valuable booklet. Use coupon or write Jeffrey Mfg. Co., 947 N. 4th St., Columbus 16, Ohio.

Data Offered On Mixed Flow Pumps

201. Data on the complete line of Worthington Mixflo pumps of the two-vane, non-clogging sewage type is offered in 16-page bulletin W-317-H16. Salient features are outlined, typical sections, performance curves and general data for five types are included. Helpful charts aid shafting selection. Copies available by using coupon or from Worthington Corp., Harrison, N. J.



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Book Tells How to Control Root Stoppages

249. Details on the proven use of copper sulfate to control root and fungous growths in sewers are contained in a brand-new book published by Phelps Dodge Refining Co., 40 Wall St., New York 5, N. Y.

Helpful Data on Bermico Pipe Fittings

280. Data are now available on fittings for use with Bermico sewer pipe and perforated pipe—T's, Y's and bends to make complete root-proof, water tight, corrosion-resistant Bermico pipe systems. Get full information by checking the coupon. Brown Co., 150 Causeway St., Boston, Mass.

How to Dispose of Sewage and Industrial Sludges

281. Get full information on the C. E. Raymond System of combined incineration and sludge drying providing high temperature deodorizing for nuisance-free sludge disposal. Flexible layouts fit large and small communities. Use handy coupon or write Combustion Engineering Inc., Raymond Div., 200 Madison Ave., New York 16, N. Y.

Have You Heard About Bionetics For Sewage Treatment?

350. Bionetics, a dry staple powder of groups of living organisms preserved with enzyme systems, is available in several types to improve and accelerate the biological processes performed at sewage treatment plants. Get full data from Reliance Chemicals Corp., Box 6724, Houston 5, Texas. Just check the handy coupon.

Here's Help for Laboratory Planning

369. A comprehensive laboratory planning guide that tells the engineer and designer how to obtain maximum space economy; utilize new and present facilities; and use functional design in locating utilities, ventilation and lighting is now available from Metalab Equipment Corp., Hicksville, L. I., N. Y. Complete data includes sectional and interchangeable lab equipment, furniture and accessories. Check the coupon for this valuable planning aid.

STREETS AND HIGHWAYS

Levels Sidewalks and Curbs Quickly and Easily

29. How the Mud-Jack Method for raising concrete curb, gutter, walks and streets solves problems of that kind quickly and economically without the usual cost of time-consuming reconstruction activities—a bulletin by Koehring Company, 3026 W. Concordia Ave., Milwaukee 16, Wis. Check the coupon.

Three-Wheel Roller For General Purpose Duty

142. A 20-page bulletin describing general purpose 3-wheel rollers covers 8, 10, 12 and 14-ton gasoline and diesel models of the Huber line. Illustrations and comprehensive explanation show component parts of the rollers and describe the general duties of the units. For your copy of this attractive bulletin, No. H-150, write the Huber Mfg. Co., Marion, Ohio, or use the coupon.

Black-Top Paver Offers Many Advantages

150. The flexible Adnun Black Top Paver lays any asphalt mix, hot or cold, in widths from 6 ft. to 13 ft. Careful design lowers operating cost and cuts maintenance. Attachments spread stone, cinders or slag. Get full data on this machine by checking coupon. The Foote Co., 1954 State St., Nunda, N. Y.

Better Highways Through Salt-Soil Stabilization

162. Practical information for the men who build, repair and maintain our highways is provided in two bulletins issued by the International Salt Co., Inc., Scranton, Pa. General principles of salt-soil stabilization, applications, plant mix and road mix are described. Check the coupon for your copies.

Cut Road Building Costs With A Tamping-Leveling-Finisher

175. For a full description of roadbuilding methods with a tamping-leveling-finisher which lays a smooth mat without forms, tamping and compacting to desired grade, get Bulletin 879-A from Barber-Greene Co., Aurora, Ill. Check the coupon today.

8 Reasons Why You Should Check the Jaeger Loader

207. In a profusely illustrated 16-page catalog devoted to the applications and special design features of the Jaeger "Load-Flo" tractor-loader unit, eight good reasons listed to back up the claim that this machine outproduces any other loader of its size. These include load capacity, balance, reach, maneuverability, automatic power adjustment by torque converter, instant reversal, multiple speed and ease of control. Check them all by getting a copy of Catalog L100-3. Check the coupon today. Jaeger Machine Co., 400 Dublin Ave., Columbus 15, Ohio.

Chipping Machine Handles Concrete Removal

225. Details on a high-speed concrete router which handles surface removal work to resurfacing operations is offered by the G. H. Tennant Co., 2578 No. 2nd St., Minneapolis 11, Minn. Be sure to investigate this versatile machine which with interchangeable cutter heads, will rout out cracks, clean pavement joints, level humps etc. Check coupon for details.

Complete Protection Of Iron and Steel Products

242. What are the advantages of Hot-Dip Galvanizing? Why does it offer complete protection at such an economical cost? You'll find the answers in the attractive booklet "Stop Rust", which gives you the full story of the process plus a comprehensive coating comparison chart. Get your copy promptly by checking the coupon or write American Hot-Dip Galvanizers Assn., Inc., 1st National Bank Bldg., Pittsburgh 22, Pa.

To order these helpful booklets check the coupon on page 32.

Portable Bituminous Mixer Will Discharge into Trucks

264. The Tower Loader, available on either the 10 or 14 cu. ft. Kwix-Mix bituminous mixer, conveniently loads bituminous mix into trucks, overhead hoppers or stockpile. Be sure to investigate these labor saving mixers and the Tower Loader. Literature offered by Kwix-Mix Co., 3029 W. Concordia Ave., Milwaukee 16, Wis. Check the coupon.

Fast, Safe Brush Cutting In Hard to Reach Places

301. The light weight, power driven brush cutting attachment which is operated by standard models of the Lombard chain saw provides a tool with great economy on land clearing operations. Initial investment is far less than separate chain saw and brush cutting machines. For literature and full description check the coupon. Lombard, 65 Main St., Ashland, Mass.

New Reflectorized Sign Faces Refurbish Old Traffic Signs

292. Get complete details on new "EZ-On" traffic signs faces ready for immediate shipments. Reflectorized faces cost only a fraction as much as new signs and are easily attached to existing traffic signs. Use the coupon for data today. Grace Sign & Mfg. Co., St. Louis 18, Mo.

Think of Aerial Surveys When You Need Maps

311. Every engineer and public official should investigate aerial surveys for maps of new areas, up-to-the-minute maps for city planning, highway relocation, surveys to plan extensions of sewers, water mains and utilities. Precise contours for topographic maps and other data in any detail desired can be furnished by Aero Service Corp., 236 Courtland St., Philadelphia 20, Pa. Interesting booklet on aerial mapping services and methods available by checking the coupon.

One Basic Unit with Attachments Does a Multitude of Jobs

149. You'll find full descriptions of the Davis Pit-Bull unit and versatile, easy-to-change attachments in the handsome new bulletin of Mid-Western Industries, Inc., 1009 S. West St., Wichita, Kans. There's a loader, trencher, dozer, roller, mower, rotary broom, post auger, crane, hammer and lift fork—units for every type of municipal maintenance and construction job—all coordinated for use with the same powerful basic unit. Be sure to investigate this remarkable equipment. Get the full story by checking the coupon.

Hot or Cold Patching Mixtures Prepared on the Job

304. By preparing your patching mixtures, hot or cold, right on the job, you can use them immediately with a minimum of handling. Get full data on the McConnaughay Model HTD "Multi-Pug" Asphalt Mixer for fast, easy and economical preparation of patch materials. Write K. E. McConnaughay, Layfette, Ind. or use the coupon.

Road Maintenance Equipment Covered in General Bulletin

306. Full specifications on the Gledhill line of road maintenance equipment, including graders of economical design, earth movers, roadside sprayers, snow plows and replacement blades, is covered in an illustrated bulletin available from the Gledhill Road Machinery Co., Galion, Ohio. Check the coupon for this convenient data.

How Motor Graders Beat the Snow Problem

307. The power and directional control of Austin-Western Four-Wheel Drive, Four-Wheel Steer Power Graders are a combination that beats the toughest plowing combination. Get data on plow and snow loader attachments for graders from Austin-Western Co., Aurora, Ill. Check the coupon.

What A Road Roller Should Give You

325. Many engineering design features that make Buffalo-Springfield rollers the answer to your needs are described in an attractive bulletin covering the C-Model Two-Axle Tandems of Buffalo-Springfield Roller Co., Springfield, Ohio. Included are details on open gridwork for better operator visibility, increased ground clearance and bevel gear drive. Investigate these and many other features listed in Form No. S 61-53. Check the coupon.

Snow Plows for Every Street and Highway Need

335. For details on the full line of Frink Sno-Plows, including the new taper-type reversible plow with hydraulic roll-over control, reversible trip-blade plows, Vee plows and all accessories, check the coupon today. Frink Sno-Plows, Inc., Clayton, N. Y.

Investigate These Street Lighting Standards

366. You can get complete data on Kerrigan factory-built "Weldforged" street lighting standards by using the handy coupon. Check these strong, well designed, yet inexpensive steel standards for practical street and highway lighting. Handsome folder also includes data sheets on floodlighting and area lighting standards. Kerrigan Iron Works, 1033 Herman St., Nashville, Tenn.

Versatile Road Wideners Improve Highways at Low Cost

374. In illustrated bulletins describing Apsco road wideners and base pavers you will find full data on two versatile pieces of road-building equipment that will help you hold down costs while bringing old roads up to present day standards. Get the full story today by checking the coupon or write to Blaw-Knox Equipment Div., Blaw-Knox Co., Pittsburgh, 38, Pa.

Aluminum Bridge Railings Eliminate Maintenance

394. Attractive bridge railings combining strength, ease of fabrication and complete elimination of costly maintenance are described in "Bridge Railings of Alcoa Aluminum", a publication of the Aluminum Co. of America, Alcoa Bldg., Pittsburgh 19, Pa. Check the coupon to get this helpful brochure.

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Rubber Tylox compensates for angularities in the line—permits immediate backfilling.

THAT'S WHY ENGINEERS AND CITY OFFICIALS CHOSE TYLOX PIPE JOINTS FOR THE NEW SEWERAGE OUTFALL IN GADSDEN, ALABAMA

Deep trenches, sandy soils and an under-water effluent were some of the problems faced on the Gadsden job* . . . The city wanted a long-lasting, low-maintenance line — built within the budget; the engineers wanted non-deteriorating pipe joints that would stay tight through the years; the contractors wanted *fast* pipe-jointing to help offset higher construction costs.

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* **PROJECT:** 3,832 ft. waste outfall sewer.
PIPE: Reinforced concrete, sizes 36" through 60" diameters.
Manufactured by: Universal Concrete Pipe Company.
Supplied by: Gadsden Concrete Pipe Company
ENGINEERS: McGeorge, Haggerty & Associates, Cleveland, O.
CONTRACTORS: Daniels Construction Co., Birmingham, Ala.

1068

To order these helpful booklets check the coupon on page 32.

CONSTRUCTION EQUIPMENT AND MATERIALS

Safety Lantern With Pencil Beam Signal

70. Get information on the Dietz "Night Watch" Safety Lantern with special globe design that saves fuel by intensifying light rays into a pencil beam. Full details available from R. E. Dietz Co., Syracuse, N. Y. Just check the coupon for full data.

Electric Power Wherever You Need It

75. Electric power for every job—for construction, maintenance and emergencies—is always available for the owner of a convenient Homelite carryable generator. These compact, gasoline engine operated units are made in a variety of sizes to suit every power requirement. Get full details by writing Homelite Corp., Port Chester, N. Y., or check the coupon.

Be Sure to Check Your Tractor Shovel Needs

94. A comprehensive 16-page catalog now available from Frank G. Hough Co., 761 Seventh St., Libertyville, Ill., shows how cities, counties, contractors and others use the Model HR four-wheel drive Payloader on earth and material handling jobs. Be sure to check the ways you could use this machine. Get Form No. 225 by checking the coupon.

Streamlined Data on Tractors, Scrapers and Power Units

102. The complete line of International Industrial Power products, 73 in all, is described in a new 48-page catalog just published by International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill. Technical data has been streamlined, yet provides abundant descriptive material on each piece of equipment. Check the coupon for the latest on crawler and wheel tractors, scrapers, dozers and related attachments plus International Diesel, gasoline and gas power units.

Booklet Helps Design of Custom-Engineered Steel Buildings

110. Custom-engineered Butler steel buildings are available in every size, type and design to meet your building needs. In a helpful 32-page booklet you will find details on several basic designs and an unlimited variety of door, window and interior treatments; answers to your questions on construction and erection, and many illustrations of typical uses. Use the coupon or write to Butler Mfg. Co., Kansas City, Mo.

How to Get Better Grader Operation

111. A most interesting and instructive 20-page illustrated action booklet on how to operate a motor grader is now available from Galion Iron Works & Mfg. Co., Galion, Ohio. Designed to help operators get more effective use from the versatile motor grader, this booklet covers the hydraulic system, steering, tips on leaning wheels, proper blade positioning, turning, gear speeds and operating procedures. Colorful, easy-to-read presentation guarantees good readership. Check the coupon for your copy.

How Accurate Boring Speeds Underground Pipe Installations

135. Interesting charts showing earth boring costs, speed and accuracy for holes from 2½" to 14½" diameter and up to 80 feet long are included in 16-page Catalog No. 8 issued by Hydrauger Corp., 681 Market St., San Francisco 5, Calif. Specifications and general operating instructions are also covered.

Now Every Municipality Can Own a Trencher

173. The low cost of the Blackhawk Trench Hog, a tractor-mounted ladder type trencher makes it profitable for many municipalities to own their own trencher. Be sure to investigate this versatile machine which digs trenches to 8 feet deep, 20 inches wide. Illustrated bulletin available from Arps Corp., New Holstein, Wis. Just check the coupon.

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Spreading stone on suburban street work prior to laying asphalt surface.

THE ADNUN JR. Black Top Paver is the only tow-type paver that comes close to approaching the performance for accuracy of the larger, self-powered bituminous pavers specified for highway work.

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Adnun Jr's. are serving on street work in both large and small cities everywhere. Ask for complete details and specifications on the Adnun before you buy a tow-type rig.

If you are bidding on highway work be sure to get the full story on the many advantages of the Adnun Sr.

ADNUN JR
MODEL 8
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FOR PROMPT SERVICE
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1,001 Profitable Uses For Holmes-Owen Loader

39. The addition of a Holmes-Owen Loader to your dump truck converts it into a complete digging and loading unit that enables one man to load, haul and dump. Illustrated folder shows how this self-loading unit with hydraulic crowding action can be a real time and labor saver for the municipality or contractor. Check the handy coupon for full data. Ernest Holmes Co., Chattanooga, Tenn.

How Air Placement of Concrete Will Help on Your Jobs

215. There are hundreds of jobs that can be done easier and cheaper by air placement of concrete; reservoir, tank and pool linings, concrete maintenance of all sorts are just a few of the applications. Get full details on two models of the high speed, easily operated "Bondactor" from Air Placement Equipment Co. 1009 West 24th St., Kansas City 8, Mo. Check the coupon.

Melting and Soldering Made Easier in Shop and Field

234. Insto-Gas torches and furnaces give trouble-free service for lead melting, soldering and all other jobs where a steady, clean, hot flame is needed. Convenient cylinders require no regulating gauges and attach directly to standard furnace assembly. Full details from Insto-Gas Corp., 1977 E. Woodbridge, St., Detroit 7, Mich. by checking the coupon.

New Advantages In Boiler Construction

309. Get the latest data on cost-saving tube-supported wall enclosures for large and small boilers from Bigelow-Liptak Corp., 2550 W. Grand Ave., Detroit 8, Mich. 12-page booklet gives full details. Check the coupon today.

SNOW AND ICE CONTROL

Attachments Keep Snow-Thrower On Job the Year 'Round

46. A variety of attachments designed to fit the rugged tractor unit of the Maxim Snow Thrower make it an all-year worker ready for mowing, cutting, dozing, towing and rolling. Full details on these economical snow throwers and their useful attachments are covered in bulletins offered by Maxim Silencer Co., 85 Homestead Ave., Hartford, Conn. Check the coupon for this data.

Uniform Salt Spreading Saves Material

145. The wide, thin pattern provided by Tarco "Scotchman" spreaders avoids salt waste, saves time and labor. Get Folder BL for full details on this spreader and table of material application rates. Use coupon or write Tarrant Mfg. Co., Dept. PW, Saratoga Springs, N. Y.

Ice Control Without Corrosion Dangers

208. Virtually all corrosion is prevented when rust inhibitor "Banox" is used in conjunction with salt for snow and ice control. Properties of this material and performance results are described in bulletins issued by Calgon, Inc., Hagan Bldg., Pittsburgh 30, Pa. Check coupon for your copies.

Cleaner Plowing Without Obstruction Worries

254. Dependable "Trip-Rite" snow plow trip action does away with danger and annoyance of obstructions even at high speeds. Sturdy toggle joint arrangement minimizes shock and rights plow blade in split second action. Complete information is offered by Davenport Besler Corp., 2305 Rockingham Rd., Davenport, Iowa. Check the coupon now.

Get Full Data On Aggregate Spreaders

286. Accurate control for spreading crushed rock, chips, sand or ice control materials is featured by all models of Highway Equipment Co. materials spreaders. Data on both trailer and tailboard types available by checking the coupon. Highway Equipment Co., 630 D. Ave., Cedar Rapids, Iowa.

STREET LIGHTING

Engineering Data on Aluminum Lighting Standards

256. Latest designs and applications of all-aluminum, seamless, tapered lighting standards, traffic signal posts and elliptical lighting brackets plus detail drawings and mechanical specifications are provided in a comprehensive 16-page bulletin issued by Pfaff & Kendall, 84 Foundry St, Newark, N. J.

Street Lighting Application Curve Eliminates Calculations

257. An easy-to-use chart from which illumination level, spacing and proper mounting height can be determined has been prepared by the Illuminating Engineering Laboratory, General Electric Co., West Lynn 3, Mass. For a copy of the chart and instructions on its use check the handy coupon.

CIVIL DEFENSE

Get the Facts on Air Raid Sirens

86. There's more to be considered in air raid warning sirens than the loudness of the signal. Get complete information on efficient size and spacing of sirens from Federal Sign and Signal Corp., 8733 So. State St., Chicago, Ill., by using coupon.

REFUSE COLLECTION AND DISPOSAL

How to Reduce Refuse Collection Costs

123. The sequence of operations for fast loading and refuse compaction in the Gar Wood Load-Packer are illustrated and described in 12-page folder W-110, together with size data and details of hydraulic elements. Be sure to check all details of the efficient Load-Packer system. Check coupon or write Gar Wood Industries, Wayne Division, Wayne, Mich.

Thinking of Sanitary Landfills? Get This Booklet Now

131. One of the most informative descriptions of the sanitary landfill method of garbage and refuse disposal is presented in Caterpillar's 16-page booklet "A Look to the Future with Sanitary Landfill." The booklet is designed to serve as a guide to proper site selections, the choice of the right equipment to do the job, and the actual operations of sanitary fill. Pictorial treatment shows how and when to start such a program, what to look for in a site, benefits received by the community, and other important considerations. Published by the Caterpillar Tractor Co., Peoria 8, Ill. Check the coupon for your copy.

Increasing the Efficiency of Bulk Rubbish Collection

177. Strategically spotted bulk containers can be handled by one man operating a Dempster-Dumpster equipped truck. Get full details of this cost-saving system of rubbish collection, as used by many cities to increase efficiency and eliminate unsanitary conditions. Write Dempster Brothers, Inc., 952 Dempster Bldg., Knoxville 17, Tenn., or use the handy coupon.

Efficient Landfill Operations For Small Communities

349. Step-by-step photos and concise text are used in a bulletin of the Oliver Corp., to show the construction and operation of a sanitary landfill, using equipment especially suitable for the smaller community, the Oliver OC-3 Tractor-Loader. Besides providing economical refuse disposal, many other jobs handled by this unit are suggested. For a copy, write to the Oliver Corp., 400 W. Madison St., Chicago 6, Ill. or check the coupon.

What You Should Know About Refuse Incinerators

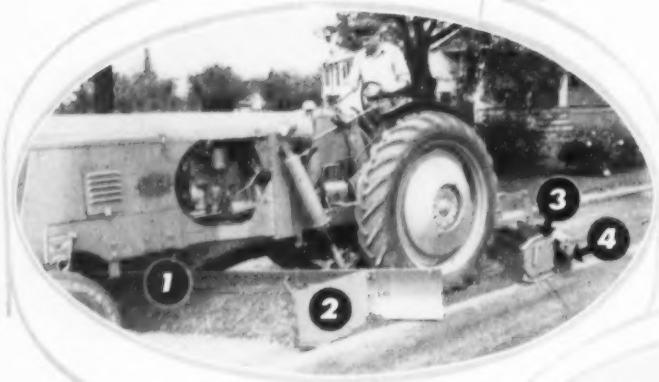
362. Two helpful bulletins tell what you should know about low cost refuse incineration for the small community and for larger cities. Your questions on mechanical stoking, burning rates and operating problems are discussed. Get Bulletins 217 and 223 from Nichols Engineering & Research Corp., 70 Pine St., New York 5, N. Y. Just check the coupon.

Check These New Features On Refuse Collection Bodies

383. The all-new Heil "Collectomatic" refuse collection unit incorporates the best features suggested by municipal operating crews, supervisors and private operators to provide easy loading, simple operating mechanism, bulldozer type packing, fast dumping and many other important advantages. Check them all by getting attractive Bulletin BH-5410-3 from The Heil Co., 3044 W. Montana St., Milwaukee 1, Wis. Your copy is ready—just check the coupon.

HOW HUBER SOLVES

Two Special Problems



SMOOTH BERMS IN ONE PASS

Hydraulically controlled blade (1) pulls in berm material to edge of pavement where gathering blade (2) carries it until needed to fill low spots. Rear wheel compresses fill material. Hydraulically controlled berm leveler (3) removes and feathers-out excess material. Cleaner blade (4) sweeps pavement clean.

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Huber Side Dozer attachment enables Maintainer to scalp berms and shoulders under any guard rail 6" or more off ground. Hydraulic action pushes 48"x6" blade to remove sod and gravel, formerly a laborious hand operation. Side dozer has 72" reach.

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NOTE TO CONTRACTORS

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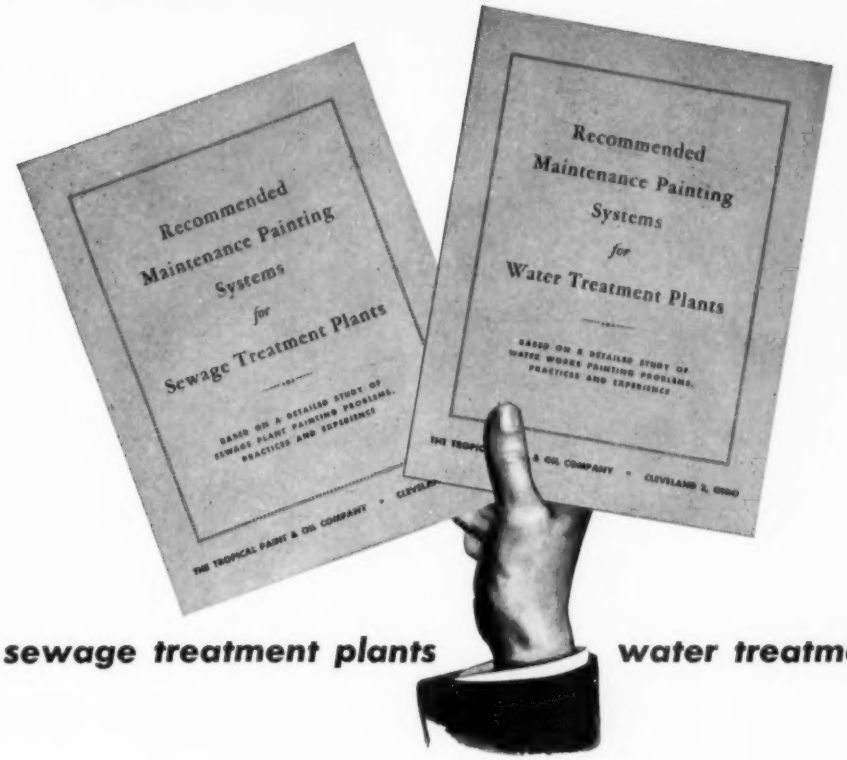

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BOOKS *in Brief*

Are you building an adequate engineering library? Here are selected reviews of the latest books and technical bulletins pertaining to engineering practice in the public works field.

HIGHWAY ENGINEERING

This fine highway engineering book is written especially for junior and senior students; but it also summarizes important new developments in highway engineering in a manner to aid practicing engineers. Greatest weight is given in the text to design; lesser weight to construction, for both cannot be covered adequately in one book of reasonable size. There are chapters on planning, economy, finance, surveys and plans, design, drainage, roadside development, traffic engineering, subgrade structures and surfacings. The authors are L. I. Hewes, Bureau of Public Roads, who died before completion of the book, and C. H. Oglesby, Professor of Civil Engineering, Stanford University. 600 pages; John Wiley & Sons, Inc., $8.

MATERIALS OF CONSTRUCTION

This book, according to the jacket, presents the latest data concerning the sources, manufacture and fabrication of the principal materials of construction. It gives information about the more important mechanical and physical properties and the influence of various factors on these properties. There are 32 chapters. The authors, M. O. Withey and G. W. Washa, are professors at University of Wisconsin. John Wiley & Sons, Inc., $9.

SYMPOSIUM ON WATER POLLUTION

In our September issue, we stated that Bulletin 43 containing the Proceedings of the Third Annual Symposium on Water Pollution held at Louisiana State University, Dec. 13-14, 1953, could be obtained from Engineering Experiment Station, Louisiana State University, Baton Rouge 3, La. The cost of this booklet is 50¢; it is not sent free as stated originally.

SURVEY AND TREATMENT OF MARSH DEPOSITS

Bulletin 314 of the Highway Research Board contains data on peat classification and profile; Blasting of soft soils; Excavating soft soil and refilling; Direct filling on soft soils; piling through soft soils; consolidating soft soils by vertical sand drains and other types of sand drains; and general information. Also contains references; bibliographies and author index. 95 pages; Price $1.20. Copies from Highway Research Board, 2101 Constitution Ave., Washington 25, D. C.

TREATING TRADE WASTES

This is an 8-page folder giving case histories of four industrial waste treatment jobs using dolomitic lime. These are: Plating wastes; plating and pickling liquor wastes; pickling liquor wastes; and oil and water emulsion. Flow sheets for each are shown along with data on the problem and the solution. Ask for Bulletin No. 2, The Finishing Lime Association of Ohio, 240 Huron St., Toledo 4, Ohio.

SNOW MELTING

A 30-page report has been issued by A. M. Byers Co., Pittsburgh, Pa., covering snow melting systems on roads, streets and driveways. These use heated water mixed with antifreeze which is circulated through wrought iron pipe systems. A discussion of construction and operational costs is included. Copies free by writing Byers' Engineering Service Department at the above address.

URBAN TRAFFIC CONGESTION

This bulletin, No. 86, issued by the Highway Research Board, contains two papers presented at the Thirty-Third Annual Meeting of the Highway Research Board held at Washington, D. C., Jan. 12-15, 1954, on the increasingly important subject of urban traffic congestion. 39 pps. Price 60¢. Copies from Highway Research Board, 2101 Constitution Ave., Washington 25, D. C.

SEWERAGE ENABLING ACTS

The State Water Pollution Control Board, Sacramento, Calif., has issued Publication No. 1, 1954, which is a digest of California sewerage enabling acts. This 64-page booklet serves both as a guide and as a handy reference to the salient points of the 25 enabling acts. Single copies sent free; additional copies are a sliding scale of costs. Address SWPCB, Room 610, 721 Capitol Ave., Sacramento 14, Calif.

WATER SUPPLY AND WASTE DISPOSAL

This is a book that many have been waiting for. It is the comprehensive treatment by Gordon Fair and John Geyer of water supply and waste disposal, and it contains more than 900 pages. Obviously it is impossible to give, in a limited space, and review of such a large technical book. In the first half are treated the problems of collection and distribution of water and the collection and removal of wastes. In the second half the treatment of water and "waste water" is dealt with. There are 30 chapters, an appendix, a bibliography and, of course, an index. The bibliography appears complete so far as books, government publications and association journals are concerned. The publisher is John Wiley & Sons, Inc., 440 Fourth Ave., New York; the price is $15.

HIGHWAYS IN THE UNITED STATES

This is a new edition of the pamphlet published by the Bureau of Public Roads. It describes the history, administration, financing, and use of the highway systems, and growth and current operation of Federal aid for highways. Included also are tables, sketches and chart. 24 pps. Copies from the Supt. of Documents, U. S. Government Printing Office, Washington 25, D. C., at 20¢ a copy.

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In your present planning for improvement of spectator facilities for sports events in your municipality, you can be assisted greatly by the broad experience of Pittsburgh-Des Moines. We will be happy to counsel with you on your problems, and detail the time-proved adaptability of our unit-constructed Steel Deck Grandstands to every type of outdoor seating. Write today, and ask for your copy of our comprehensive Grandstand Brochure.

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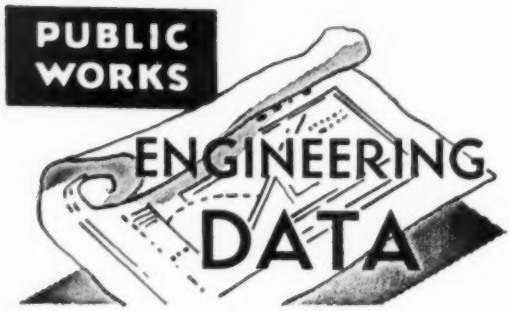
NEWARK (2) ..... 236 Industrial Office Bldg.
CHICAGO (3) ..... 1246 First Nat'l Bank Bldg.
LOS ANGELES (48) ..... 6399 Wilshire Blvd.
DES MOINES (8) ..... 943 Tuttle St.
DALLAS (1) ..... 1247 Praetorian Bldg.
SEATTLE ..... 550 Lane Street
SANTA CLARA, CAL. ..... 649 Alviso Rd.



Refuse and Ash Collection Costs and Volumes

As usual, the annual report of Easton, Pa., contains interesting data on refuse and ash collection volumes and costs. Refuse collected during 1953 amounted to 7,585 tons (compared to 6,508 tons in 1943). Costs totaled $51,439.56 in 1953, compared to $18,294.77 in 1943. Costs are allocated to "labor" and to "trucks". For the former, costs rose during the ten years from $15,552.45 to $48,750.14; but the costs for trucks decreased from $2,742.32 in 1943 to $2,689.42 in 1953.

Loads of ashes collected in 1953 were fewer than were collected in 1943—5,623 as compared to 7,197 in 1943. Labor costs increased from $19,732.27 to $29,485.85. The total cost per load was $7.20, of which $6.326 was for labor, $0.478 for trucks and $0.402 for supervision.

Total cost for collection and disposal of garbage and rubbish are given as follows, per ton: Labor for collecting $7.176; trucks $0.396; handling at incinerator $1.861; supervision $0.298; and maintenance and operation $1.26.

Costs of Laying Water Pipe in Hartford, Conn.

Cost data on pipe laying have been carefully maintained for many years by the Water Bureau of the Hartford County, Conn., Metropolitan District Commission. The costs reported in the 1953 annual report and comparisons with previous years on some sizes follow.

In the following, laid in 1953, trenching costs were not included: 316.6 ft. of 4-in. were laid at a cost per ft. of $2.228, of which $1.568 was for material and $0.660 was for labor. Corresponding data for other sizes are: 6-in., 9,014 ft., $2.437, $1.895 and $0.542; 8-in., 40,330 ft., $3.838, $2.859 and $0.607; 12-in., 3,043 ft., $5.003, $4.498 and $0.447, including some done by contract on which, presumably, labor costs were not kept separate; 16-in., 440 ft., $7.803, $7.177 and $0.626.

When installation was made complete by the Water Bureau, with all items presumably included, costs were as follows: On 735.5 ft. of 6-in., $4.005 per ft.; on 22,090 ft. of 8-in., $4.605; on 1831 ft. of 10-in., $5.335; on 9,314 ft. of 12-in., $7.290; on 1855 ft. of 16-in., $8.031; and on 432 ft. of 20-in. $13.281.

Comparisons with four previous years, in the following order, 1952, 1951, 1950 and 1949, for the various sizes follow: 6-inch, $3.379, $4.491, $3.756 and $3.466; 8-in., $4.804, $4.695, $4.360 and $4.603; for 12-in., $6.353, $7.093, $6.480 and $5.944; 16-in., $13.740, $9.236, $9.456 and $8.203.

It will be appreciated that costs are likely to vary from job to job because conditions affecting costs also differ.

BANOX® CATCHES THE CULPRIT

. . . locks up Salt-Slush Corrosion

The use of salt for the removal of snow and ice has been standard practice for many years. Salt is cheaper* and more effective than abrasives, but salt *does* produce salt-slush corrosion; here's where BANOX steps in.

BANOX catches the salt-slush corrosion culprit and ends this menace to cars, bridges, municipal equipment and other costly metal surfaces. When Banox is added to de-icing salt you get the benefits of salt without the penalty of salt-slush corrosion. In addition, a Banox and salt mixture leaves no residue, eliminating costly spring clean-up of clogged gutters, sewers and catch basins.

Treat your community to a winter of clean roads, made possible by salt and Banox. You'll have fewer complaints of rust, and motorists will have safer driving. Write for the free booklet: "Stop, Look and Save with Banox."

BANOX

calgon, inc.

HAGAN BUILDING, PITTSBURGH 30, PA.

*Comparative cost figures for both city streets and highways indicate that you save as much as $4.27 per mile by using rock salt instead of abrasives.

CHLORINIZER gets vote of confidence at Denver, Colorado

On June 11, 1951, this Model CVS Builders Chlorinizer was installed and placed in service entirely by the plant operators at Denver's 65 MGD Marston Lake North Side Filter Plant. The plant personnel is "well pleased" with the Chlorinizer, according to Denver's Water Board Sanitary Engineer George J. Turre.

The Marston Lake Plant supplies a network stretching to points as far as five miles away. This necessitates heavy chlorine dosages in order to hold safe residuals throughout the system. Chlorinizer, with its wide metering range, has met every demand placed upon it. Dosage adjustments have proved easy to make due to Chlorinizer's responsive chlorine control valve. The direct-reading Chlorine Sightflo Indicator has also provided a positive means of checking the feed rate.

More and more progressive municipalities like Denver are turning to Chlorinizer — for new projects, for replacement, for plant expansion. May we quote on your requirements? Send details or write for descriptive bulletins to Builders-Providence, Inc., 356 Harris Ave., Providence 1, R. I.

Sanitary Engineer George J. Turre writes: "The Chlorinizer has proven most satisfactory. The personnel are well pleased with the performance of the Builders-Providence Chlorinizer."

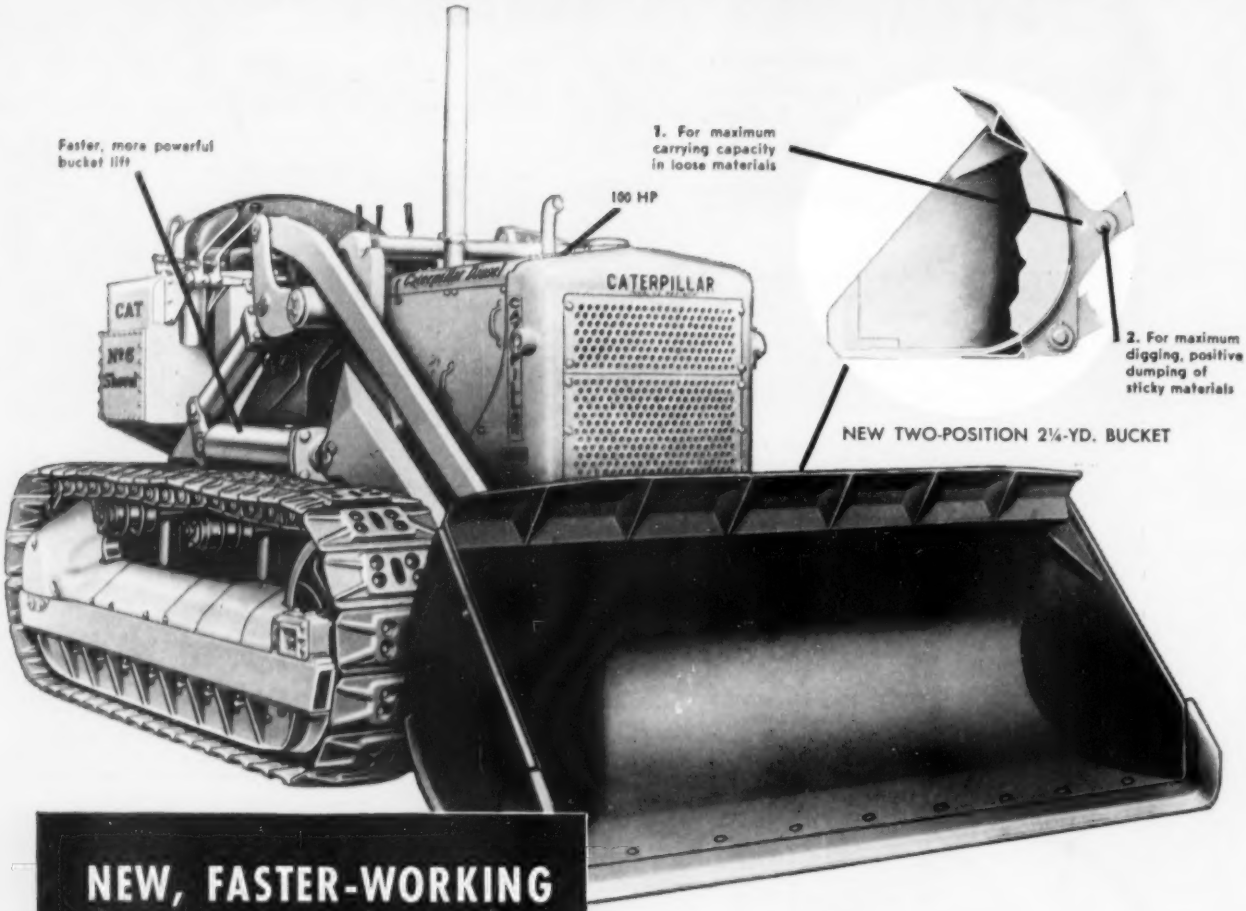
BUILDERS-PROVIDENCE

DIVISION OF B-I-F INDUSTRIES, INC.

BUILDERS IRON FOUNDRY • PROPORTIONEERS, INC. • OMEGA MACHINE CO.

B-I-F METERS FEEDERS CONTROLS

ANNOUNCING



NEW, FASTER-WORKING NO. 6 SHOVEL at no increase in price

NEW POWER—the CAT* Diesel Engine now gives you 100 HP, an increase of approximately 25 per cent—and you get it with Caterpillar ruggedness and economy.

NEW 2¼-yd. BUCKET gives you 12½ per cent more capacity, gets heaping loads, dumps cleanly. Exclusive two-position feature gives maximum use of bucket capacity in *any* material: rear position for clean, fast dumping of sticky materials; forward position for carrying heaping loads of loose materials.

GREATER LIFTING POWER and speed with new hydraulic pump: its pressure is stepped up more than 40 per cent for fast, positive lifting action under *all* load conditions.

These extra values cost you no more in price!

These useful attachments increase your job range: skeleton rock bucket, quarry bucket, heavy-duty narrow bucket and bulldozer blade.

Versatile new No. 6 Shovel is built to do more work at less cost

Weight distribution, engine horsepower and bucket capacity are carefully balanced so that the tracks *stay* on the ground for maximum stability.

Your Caterpillar Dealer will be glad to demonstrate the new No. 6 Shovel *on the job*. See him today. And count on him for fast service and genuine factory parts.

Caterpillar Tractor Co., Peoria, Ill., U.S.A.

CATERPILLAR*

*Both Cat and Caterpillar are registered trademarks—®

NAME THE DATE... YOUR DEALER WILL DEMONSTRATE

Municipal Garage and Repair Shop Designed for Function and Appearance

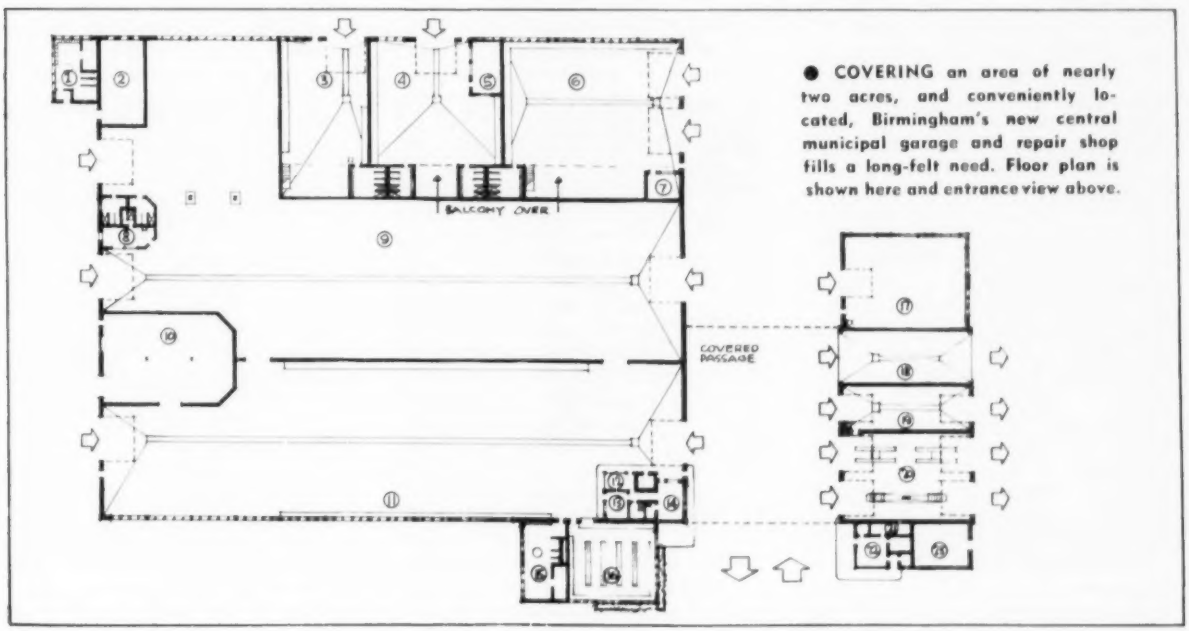
STEADY growth and need for more efficient and economical operation had indicated for some time the desirability of a central garage and repair shop for all the mechanical equipment used by the City of Birmingham. The firm of Charles H. McCauley was commissioned to prepare the drawings for this structure, and the J. F. Holley Company was the successful bidder for the actual construction work. The building, which has been completed and is now in operation, is of steel frame construction; the roof framing is of steel trusses with bar joists on purlins. The roof slab is of poured Gypsum with a bonded tar and gravel finish roof.

Dark green structural glazed tile was used on both exterior and interior walls of the servicing areas, not only for architectural effect but also for ease of maintenance. This material also has been used in all toilet and locker room areas. Other interior partitions are concrete block veneered below the continuous steel windows with gray brick. The floors are of reinforced concrete except the toilet and shower room floors which are of ceramic tile. It is interesting to note that approximately 75,000 8"x16" concrete blocks used in this construction were made in a City owned concrete block plant.

The building covers an area of 75,000 sq. ft. Housed in it are the following departments: Repair shop with attendant parts department and storage; administrative offices; an equipment storage garage; maintenance and repair shop for traffic signals; maintenance and repair shop for the special equipment of the fire department; repair shop and storage area for fire hydrants; and, the office of the Paved Street Department. Also provided are facilities for gasoline, oil and battery services; for oiling and greasing the equipment; and for washing all vehicles.

Careful attention was given in designing the building to the traffic and repair flow and its easy and economical circulation. A traveling crane spans the repair shop and machine shop areas. Monorails are used in the other repair areas. Motor operated rolling steel doors are installed for the equipment entrances. A minimum number of columns support the roof, adding to space efficiency. Each section of the building is complete with locker rooms, toilet and shower facilities.

Since all indications point to the continued growth of Birmingham, careful attention was given to the location and the design of the building for easy and logical expansion. Cost of construction was $600,000.



● **COVERING an area of nearly two acres, and conveniently located, Birmingham's new central municipal garage and repair shop fills a long-felt need. Floor plan is shown here and entrance view above.**

New Technique for REPAIRING SPALLED JOINTS

● SPALLING caused by improper location of dummy groove 3 or 4 ins. to right of sealed groove.

AS in any other phase of road-building, reasonably careful construction practices are required to produce good joints in concrete paving. And while it's easier to do the job right in the first place, there will always be occasions when poor workmanship, faulty techniques, and careless inspection will combine to produce a less-than-acceptable job. When that happens, the necessary repair work often requires more ingenuity than the original construction.

Spalling of contraction joints on a recent concrete expressway is a case in point. Shortly after the divided highway was opened to traffic it was found that spalling had occurred at some of the contraction joints. A careful investigation revealed that the principal causes were faulty installation of the joint assembly and improper edging of the joints. In a number of cases, for example, the buried contraction plate was not installed in a vertical position. As a result, when the pavement expanded there was a tendency for one slab to climb the inclined face of the adjacent slab, resulting in a shearing action at the top edge of the joint. In other cases, the surface groove was found to have been located as much as several inches from the buried steel plate.

These spalled joints were repaired using a rather unusual technique—consisting of removing the spalled portions, thoroughly cleaning the area to be patched, and filling with a concrete patching mixture.

In removing the damaged area at the joints, a concrete saw was used to make a vertical cut 1½ to 2 ins. deep, approximately 6 ins. back of the contraction joint, and extending transversely for the length of damaged section. This not only made it easier to break out the concrete with an air hammer—the next operation—but also produced a straight vertical edge to patch against.

After removing from 1½ to 3 ins. of broken concrete with an air hammer, the area was meticulously cleaned of all loose material, and a final dust-free surface was obtained by blowing with compressed air. In order to remove the film of slime left by the sawing operation, the vertical face of the saw cut was wet-scrubbed.

Making the Patch

After these cleaning operations were completed, the area was ready to receive the patch which was applied in three steps. First the entire area to be patched was lightly moistened with a whitewash brush to give a damp appearance (not wet). A grout mixture was then prepared using one part of cement and one part sand (100% passing #16 mesh) with sufficient water to give a "thick paint" consistency. This mixture was thoroughly brushed into the surface and sides of the area to be patched using a stiff bristle brush. Prior to placing the patch, a joint cap was inserted over the contraction plate at the proper location. The patching mixture was placed and vigorously tamped to insure proper density of the material and positive contact with the slab being patched. The tamping process was also necessary to bring sufficient mortar to the surface to permit satisfactory finishing.

Success of this type of patching depends to a large degree on the mixture. Proportions were 1:5, 40 percent coarse pea gravel and 60 percent sand (high percentage of sand used because of coarse particles in the sand). Water was added to give a dry consistency, so that when squeezed in the hand the mixture would "cake" leaving a trace of moisture in the palm. An air-entraining agent and 2 percent by weight of cement, of calcium chloride for high early strength was added to the mixing water.

After finishing and edging, the surface of the patch was broomed to give a surface texture similar to than in the existing concrete. When the concrete had gained sufficient strength, the joint cap was removed and the opened joint cleaned of all material to the full depth of the patch by a narrow steel hook. This procedure was followed in order to assure that when the pavement expands, compressive stresses will act on the vertical faces of the existing pavement and not on any part of the vertical face of the patch. The patched areas were cured by wet burlap for three days after which the joints were filled with joint filler and the roadway opened to traffic.

These patches were inspected after being subjected to 15 months of heavy traffic and exposure to one winter of freezing and thawing. The excellent condition of the patches at that time demonstrates that construction defects of this type can be corrected. A small crew, properly supervised and using correct methods, can patch spalled joints with concrete in such a manner that the appearance and riding qualities of the original pavement are not affected.

● SPALLING was caused in this instance by inadequate groove or by improper edging in finishing.

● CONCRETE saw is used to make a vertical cut 1½ to 2 inches deep 6 ins. back from the joint.

● SAW cut has been completed some distance from the spalled joint and repairs can be started.

● FIRST step is to remove the concrete in the area to be repaired. Air hammer is best tool for this.

● AFTER moistening the concrete, grout mixture is brushed onto surfaces with a stiff bristle brush.

● PATCHING mixture is tamped into place. Note that the concrete mix used has very dry consistency.

● TO MATCH the surface texture of the adjacent concrete, the patch is carefully finished and broomed.

● ALL concrete over joint is removed to full depth of the patch. Wet burlap is used for curing.

● JOB completed: One of the repaired joints after curing and joint sealing. All ready to go.

Municipal Water Supply Softened by Continuous Base Exchange

Report on First Installation at Baxter Springs, Kansas

A. L. WILCOX and

R. D. FORGER

Design Engineer and Technical Ass't.,

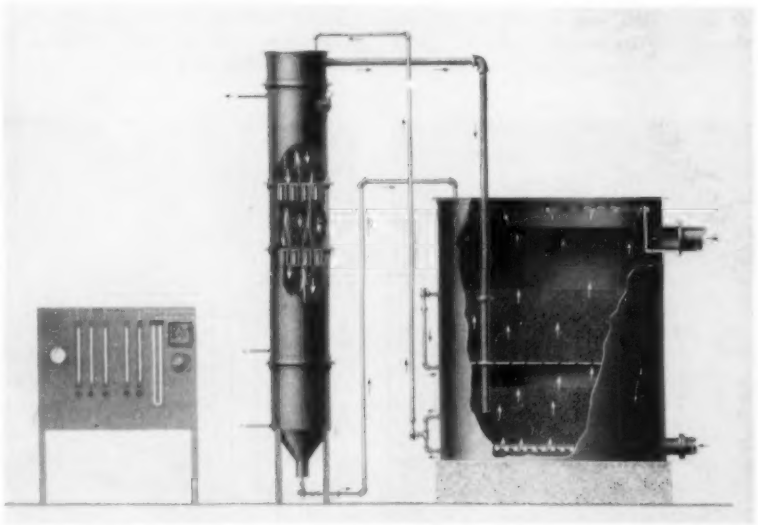
The Dorr Co., Engineers.

SOFTENING of municipal and industrial water supplies, using batch base exchange treatment methods, has been successfully practiced for many years and in many instances this procedure has exhibited decided advantages over conventional lime-soda ash treatment. Although continued improvement of cation exchange resins has resulted in longer softening runs, periodic shutdowns for resin regeneration are always unavoidable. During the down period, flow of treated water must be halted and storage facilities sufficient to meet the anticipated demand have to be provided. If a constant supply of treated water is a necessity, a second batch unit must be furnished to operate while the first unit is being regenerated.

With this problem in mind, extensive research programs were instituted prior to 1945 in an effort to develop a continuous softening process. One of these investigations produced a small scale unit consisting of a softening cell and an auxiliary regeneration cell. This system softened without interruption. A portion of the spent resin was continuously removed from the softening cell, regenerated in the second column, and returned for reuse. However, when the system was scaled up to larger size, resin short circuited in the regeneration column, and it was evident that further modifications were necessary before the unit could be offered commercially.

In 1945 The Dorr Company became interested in continuous base exchange softening and continued development work on a two-component system similar to that which showed promise on a small scale. This work was carried on first in the laboratory and then in a commercial size unit at their Research and Testing Laboratories in Westport, Connecticut. Short circuiting was eliminated by the installation of special baffles and revision of brine and rinse water distribution systems in the regeneration column. In addition, the softening cell was constructed with a flat rather than conical bottom.

Development continued at Westport until 1949 at which time the unit was ready for commercial demonstration. At the Lansing, Michigan, water conditioning plant a system consisting of a 6-foot diameter softening cell and a 22-inch diameter regeneration cell was erected for field tests. This demonstration from August, 1949, through January, 1950, proved that a full-size continuous system was commercially workable.



● **HYDRO-SOFTENER consists of a softening cell, shown at the right; a regeneration column, center; and a panel board, left, which houses the meters and instruments necessary for controlling the operation. Hard water enters at bottom right, passes upward through the resin and flows out at the upper right.**

In the first series of tests the softening cell was an open top tank partially filled with approximately a three-foot static depth of resin. Raw water with 365 ppm hardness as $CaCO_3$ was softened in one stage to a residual hardness of 13 to 75 ppm. Total hardness reduction depended upon the rate of raw water flow through the unit. When these initial tests were completed, a diaphragm plate was installed to separate the cell into two compartments horizontally.

The same water was softened to but 3 to 6 ppm hardness in two stages. In this method of treatment most of the hardness is removed in the lower compartment by partially exhausted resin. As the semi-treated water flows upward, further softening is carried out in the top compartment by freshly regen-

erated resin. A brief summary of operating results from the tests at Lansing is shown in Table I for both single and two-stage softening operations and with a variety of flow rates from 125 to 250 gpm.

The first commercial Dorrco Hydro-Softener was installed at the Baxter Springs, Kansas, water treatment plant in October, 1952. Treatment consists of aeration of extremely hard well water for oxidization of dissolved iron compounds, pressure filtration to remove precipitated ferric hydroxide, and softening. The Hydro-Softener, which has a maximum capacity of 200 gpm, softens the entire volume of water required by the municipality in the winter. However, during some summer months the demand of 350 to 400 gpm, makes it necessary to blend softened water with hard filtered water to satisfy requirements.

The Hydro-Softener used at Baxter Springs is the same size and type as that successfully demonstrated at Lansing. The softening cell, six feet in diameter and eight feet high, is supported by a 3-foot concrete base. The regeneration cell is 10 feet high and 22 inches in diameter, and the control panel is about 3 feet square. The entire system occupies a space about 10 by 6 feet in plan and 13 feet in elevation on the ground floor of the pump house. A total of 84 cubic feet of a high capacity styrene base resin is in constant circulation throughout the two cells.

This unit reduces the hardness of filtered well water from about 500 ppm at $CaCO_3$ down to 30 to 50 ppm, depending upon the raw water flow. A summary of operating results obtained late in 1952 is shown in Table II. During this test period, softer water from a second auxiliary well was treated for comparison purposes.

The commercial Dorrco Hydro-Softener for hardness removal—such as the Baxter Springs installation—comprises two basic components—a two-compartment softening cell and a five-compartment regeneration cell. Horizontal perforated steel plates separate the compartments in both cells which are of welded steel construction. In the regeneration column, pipe nipples attached to the underside of the plates serve to introduce resin to the central portion of the compartment below. To prevent jetting in the softening cell the perforations in the plate are fitted with street ells.

Raw water is distributed in the lower compartment of the softening cell through a conventional grid system of horizontal pipes which insure equal distribution to all parts of the tank bottom. A peripheral notched weir and overflow launder carry off the softened water at the top of the open tank.

Resin is transferred between the two compartments of the softening cell, and to and from the regeneration cell, by means of three standard water ejectors, each controlled by a flowmeter mounted on a panel board. The volume of water passing through first the flowmeter and then the ejector regulates the vacuum in the siphon leg of the ejector and thus the volume of resin withdrawn from the compartment.

Also on the panel board are flowmeters which indicate the flow rate of brine and rinse water into the regeneration column and a calibrated water manometer measuring the rate of resin transfer between the bottom of the regeneration cell and top of the softening cell. This is the only actual measurement of resin transfer and the control water through the corresponding flowmeter is adjusted only during initial operation or when the characteristics of the raw water change radically. Flow through the other two transfer flowmeters is then adjusted accordingly to maintain resin equilibrium in the other compartments. After these initial adjustments of the simple controls the Hydro-Softener will operate continuously without attention.

A conductivity cell on the panel board continuously indicates the sodium chloride content in the water associated with regenerated resin being transferred to the softening column. When the salt content exceeds a pre-determined limit of one to two grains per gallon this meter actuates an alarm which indicates to the operator that resin rinsing is below par and that the volume of rinse water should be increased. With additional rinsing stages to supplement the usual two stages, any desired salt content may be attained. The separate regeneration column greatly reduces the possibility of contaminating treated water during regeneration which, in batch units, is carried out in the softening cell.

Operation of the Hydro-Softener in both cells is counter-current with

TABLE I—Operating Results from Experimental Hydro-Softener

	SOFTENING		REGENERATION		
Flow Rate,* gpm	Raw Water Hardness, ppm	Treated Water, Hardness, ppm	Rinse Water Rate, gpm	Resin Transfer Rate, gpm	Salt Use lbs/min
		Single Stage Operation			
125	363	13	3.8	2.0	1.44
150	355	33	3.0	1.0	1.0
175	365	29	3.5	1.7	1.6
200	355	37	3.8	2.0	1.44
225	365	75	3.25	1.0	1.44
250	355	75	4.0	2.0	1.44
		Two Stage Operation			
100	355	3	3.8	2.0	1.44
150	358	6	3.5	2.0	1.0
200	360	4	3.8	2.0	1.44

*Does not include 20-25 gpm of control water also softened in same operation.

TABLE II—Operating Results at Baxter Springs, Kansas

	SOFTENING		REGENERATION		
Flow Rate* gpm	Raw Water Hardness, ppm	Treated Water, Hardness, ppm	Rinse Water Rate, gpm	Resin Transfer Rate gpm	Salt Use lbs/min
170	160	3	2.3	2.0	0.61
170	160	4	1.8	2.0	0.61
200	495	32	5.0	2.0	2.2
200	495	48	4.3	2.0	2.0

*Does not include 20-25 gpm of control water also softened in same operation.

resin flowing downward and being either expended or regenerated and rinsed by the upflowing water or brine. In each of the seven compartments in the system, resin is maintained in constant motion by the upward velocity of the liquid which expands the static bed of solids up to a maximum of 75 percent. However, the upflow rate of the liquid is always below that which will carry resin up into the next compartment or over the weir. This turbulent motion insures intimate contact between solids and liquids and results in a high degree of softening and more complete brine utilization than in batch units.

The operation, while completely continuous, can best be described by separately following the two distinct cycles of softening and regeneration. In the first cycle, hard water enters the softening cell through the distribution system in the bottom of the lower compartment and immediately comes in contact with partially spent resin. Here most of the hardness is removed as calcium and magnesium in the water are exchanged for the sodium of the resin. Water passes on to the top compartment for additional softening and then over the weir to storage or use.

Freshly regenerated resin returned from the regeneration cell is partially expended in the top compartment of the softening cell and then transferred by ejector to the lower compartment. It is completely exhausted by hard water and drawn off at two points by ejectors for transfer back to the regeneration column. Operating in this manner a single Hydro-Softener can remove from 80 to 99 percent of the hardness, depending upon raw water characteristics, raw water flow rate, and resin recirculation rate. Greater reductions are possible by passing treated water through a second unit.

The second cycle to be visualized takes place in the regeneration column where calcium and magnesium in the exhausted resin are exchanged for sodium in the brine. For control purposes an excess of spent resin is transferred to the top or fifth compartment of the regeneration cell and the excess returned by a gravity overflow to the lower softening compartment. The regeneration column is completely filled with resin during operation.

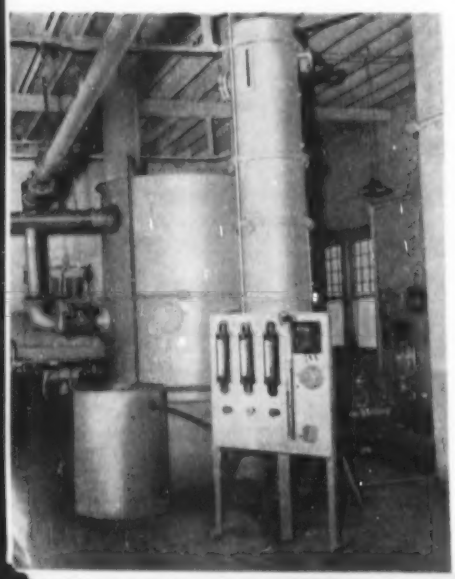
Saturated brine enters the column just below the third compartment through a series of three concentric distribution pipes. It is immediately diluted by wash water from the two lower compartments. As the resin flows downward it is regenerated in three stages, each in a separate compartment, by the upflowing stream of brine which is expended as it travels upward and finally overflows the top compartment to waste. In this manner a steady stream of spent brine is discharged, thus eliminating the periodic slug discharge common to batch operation. Spent brine passes through a small settling tank in which any entrained resin is settled out and returned to the system.

Rinse water enters the bottom of the first compartment through another concentric distribution ring at a rate usually about five times that of the brine. Fresh water rinses residual brine from partially washed resin in the lowest compartment and just above, unwashed resin is given a preliminary rinse by the water from below. Thoroughly washed resin is returned to the top of the softening cell by another ejector.

Salt consumption averages about 0.3 of a pound per kilograin of hardness removed, and resin replacement through all causes is estimated at ten percent or less per year. The unit may be operated on a part-time basis being shut down and started up as necessary. However, although operation in this instance is similar to a batch unit, it is continuous and needs no attention after initial adjustment.

A single Hydro-Softener will treat up to 800 gpm of comparatively clear water, softening it sufficiently for all ordinary domestic needs. For larger flows a number of units, each handling a maximum of 800 gpm, are necessary. Present standard softening cells are from 6 to 12 feet in diameter in 2-foot steps, and standard regeneration cells are 15, 22 and 30 inches in diameter. The proper combination of cells depends upon raw water hardness and requirements of the softened water.

For the first time commercial scale base exchange has been placed on a continuous basis with decided operating and economic advantages. In the future, the Dorrco Hydro-Softener is expected to find widespread application for the continuous removal of 80 to 99 percent of the hardness from supplies where zero hardness is neither required nor expected. The Hydro-Softener provides an economical and continuous supply of treated water of constant quality. In addition, the Hydro-Softener can be employed for cation exchange in the hydrogen cycle by the use of corrosion resistant materials of construction. There is every reason to believe it can readily be adapted to anion exchange and even to complete deionization.



● **HARDNESS is reduced normally in the Baxter Springs, Kansas, installation from an initial 500 ppm $CaCO_3$ to the range of 30 to 50 ppm.**

• • •

Reducing the Danger of Angle Parking

Angle parking has been considered a somewhat dangerous procedure, but it does increase the number of vehicles accommodated above that of parellel parking. In an attempt to keep the advantages of both systems the city of Sterling, Colorado, has recently changed the angle of parking from 45 degrees to 30 degrees. This reduces the parking space by about 20 percent but parkers will be able to back out without obstructing two lanes of traffic.

• • •

City Streets Inventoried to Determine Deficiencies

To determine critical deficiencies in streets in California cities, a basic inventory is under way. This is a joint project of a California legislative committee and the League of California Cities. The study is being based on present-day deficiencies, no attempt being made to predict future needs, and is intended to provide cities with a complete picture of their street systems. It will also supply the legislature and the League with basic data in regard to statewide transportation needs.

A REPORT on the Use of RUBBER in Bituminous Pavements

HARRY K. FISHER, Natural Rubber Bureau, Washington, D. C.

THERE are considerable data available to show that scientists and engineers, since 1925, have been progressing in the blending of various types and forms of rubber with bitumen. Most of these experiments have been where rubber was added to bitumen for paving purposes. During the early part of this period, many test sections of bituminous pavements, in which rubber was used as an additive, were laid in the United States, England, France, Holland, Malaya, Ceylon, and Indonesia. It is unfortunate that there is little factual recorded data on these particular rubber-bitumen paving experiments.

The British Rubber Development Board, London, England, noting in 1949 the excellent performance results of certain test sections of rubber-asphalt pavements laid in the 1930's, decided that a comprehensive study of the use of rubber for paving purposes should be made. They arranged, through the offices of the Natural Rubber Bureau, Washington, D. C., for the laying of four test sections of bituminous pavement in the United States, these test sections to have natural rubber powder blended in with the regular bituminous paving mixture. They were laid during 1949 and 1950. In addition to these, test sections of rubber-bituminous pavement, in which synthetic rubber and ground up rubber tire powder were used, were laid in several states by some of the larger American tire manufacturing companies. While this work was being done in America, test sections of rubber-bitumen pavement were laid in other parts of the world—England, France, Holland, Africa, Asia, Australia, and Canada. So we see that for the past five years (1949-1954) there has been considerable international interest in studying the possibilities of the use of rubber with asphalt for paving purposes.

● **MAIN ROOM of the laboratory of the Natural Rubber Bureau which was established for the sole purpose of basic research on bituminous paving mixtures.**

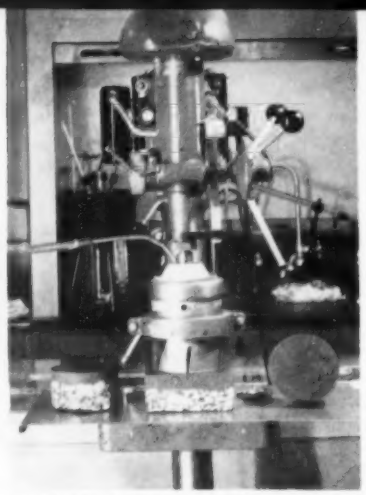
To find the answers to the many questions asked by the paving engineer on this subject, the British Rubber Development Board, in 1950, authorized the establishment of a laboratory for the sole purpose of research on bituminous paving materials, both with and without rubber. This laboratory is located at Rosslyn, Virginia, and has been in full operation since June, 1952. It is completely equipped to make a thorough investigation of this subject. The laboratory technicians scrupulously follow established tests procedures on all standard tests. The information developed by these laboratory tests is available to everyone interested in laying better highway and street pavements.

Paving specification standards have been established by state and city officials after years of research in their own laboratories and experience with paving in their own areas; also as a result of paving placed on their streets and highways in cooperative work with various organizations, such as Bureau of Public Roads, Highway Research Board, American Association of State Highway Officials, American Society for Testing Materials, Association of Asphalt Paving Technologists, The Asphalt Institute, and others. The chief items covered by these specifications are composition

(all materials), stability, density, void content, gravity, and flexibility. Naturally, the first question of the paving engineer is how does a rubber additive affect these standards.

The Natural Rubber Bureau Research Laboratory technicians are running tests and making studies on bituminous paving mixtures to get the answer to the highway engineer's question. It was quickly recognized by our research men that new test methods, other than the standard tests now used in highway laboratory work, would be required to evaluate fully the use of rubber in bituminous paving materials. We believe that rubber added to bituminous paving mixtures creates a new type of paving material; however, constant tests are being made using the recognized standard methods. Additional studies, other than the standard tests, are being made using our own design of testing equipment for studies on impact, shock, vibration, and flexure. We also have under study the tensile properties of paving mixtures. To make these tests it has been found necessary to design and construct new equipment, or where possible to adapt equipment used for other purposes.

An interesting study has been the evaluation of in-place pavements at different time periods after the laying date. Large undisturbed sections (usually 12 by 17 inches) are cut from the pavement using a diamond point saw and brought to the laboratory for various tests. Marshall and Hveem test size cores are cut from these large samples, permitting a study of stability, density, etc., on undisturbed samples. These studies are made on both rubber and non-rubber paving materials.



● **CORE drill for cutting undisturbed cores. For photographing, square section was not placed in reinforcing frame to prevent deformation and to hold it truly in place.**

The research and study projects under way in our laboratory at present include the following:

A. Physical changes occurring in paving mixtures by the addition of various types of rubber to the aggregate prior to the introduction of the asphalt to the paving mixture:

1. Changes in density, void content, and specific gravity;
2. Cohesion, recovered penetration, ratio of susceptibility, and recovered ductility;
3. Changes in stability as determined by the Hveem method of test, the Marshall and Hubbard-Field tests;
4. Changes in these points as a function of mixing temperature;
5. Variables affecting bituminous paving materials when rubber powder is added to aggregate.

B. Effect of the addition of rubber to bitumen, both penetration and cut-back grades:

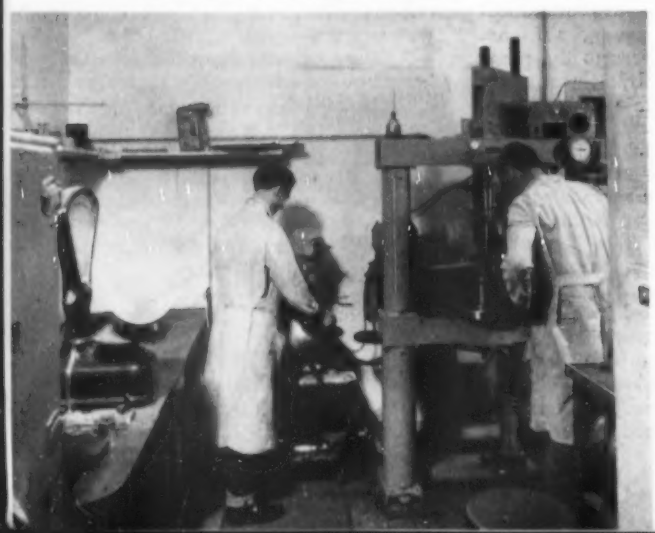
1. Changes in penetration, ductility, softening point, and ratio of susceptibility;
2. A study of viscosity as a function of:
   a. concentration of rubber;
   b. temperature variations;
   c. different types of rubber;
   d. time (mixing and aging).

To make these studies, it was necessary for the laboratory to establish a standard control mix for each type of asphalt paving material tested. This control mix was established after making and testing 250 test cores of various compositions. Once the control mix was established, sufficient material was then stocked to complete all tests and studies described in this paper. We call attention to the fact, even though it is common knowledge among laboratory technicians, that a reproducible control mixture is absolutely necessary for proper evaluation of non-rubber-bituminous mixtures as well as rubber mixes.

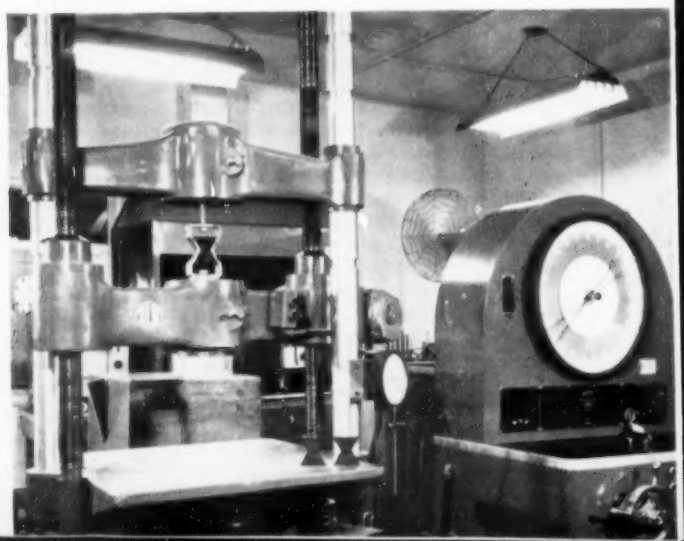
The work reported here partially covers results obtained to date from experiments listed under Paragraph A. In order to obtain these results, a total of 2850 cores were tested and studied. In addition to the data given in this report, there are many tables, graphs, and additional information available covering the results of tests and studies made under Paragraphs A and B.

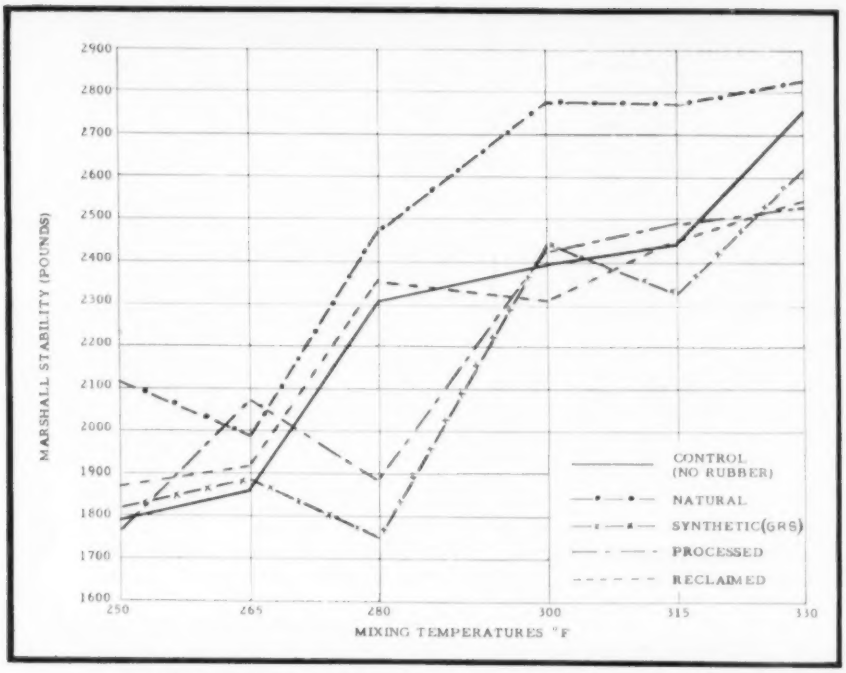
All paving material test specimens were made using a California type kneading compactor. This method

● **CALIFORNIA type kneading compactor is used on all paving material test specimens as this method appears to produce more uniformly compacted specimens for testing.**



● **NEW KINDS of testing equipment had to be developed, using powerful hydraulic testing machines, for evaluating comparative tensile properties of bituminous mixes.**





● **FIGURE 1. These curves show the effect of temperature on stability values when 4 percent of rubber powder is added to the standard bituminous mixture.**

was adopted as we believe we are able to produce more uniformly compacted specimens than from other methods now in use in many testing laboratories. Tamping temperature was maintained at 10°F. less than the actual mixing temperature. Twelve test cores were made for each percentage, temperature, and type of rubber used in these specimens, along with twelve cores for each control study.

The adopted control mix was based on 5.5 percent asphalt content. All test cores contained the following:

Passing	*Retained*	
3/4"	1/2"	64 grams
1/2"	3/8"	165 grams
3/8"	#4	83 grams
#4	#10	67 grams
#10		49 grams
Stone Screenings		382 grams
Washed Sand		305 grams
Asphalt		65 grams
Total		1180 grams
Gravity of washed sand (apparent)		2.60
Gravity of stone passing #10		2.94
Gravity of stone retained on #10		3.03

Materials for each specimen was weighed individually, as larger batch mixes would have caused possible segregation. The above amount (1180 grams) of aggregate and asphalt was selected as it gave a height of 2 5/16 inches for a four-inch diameter core when compacted. These are the required dimensions for testing by the Marshall and Hveem stability methods.

The accompanying graph shows the stability values obtained from these tests. (Fig. 1)

As a result of the preceding studies, it was deemed necessary to determine to what degree asphalt is affected by the addition of rubber powder. As outlined under Paragraph B, viscosity studies were made as to the effect of adding rubber powder to asphalt and also the effect of prolonged heating of rubber-asphalt blends.

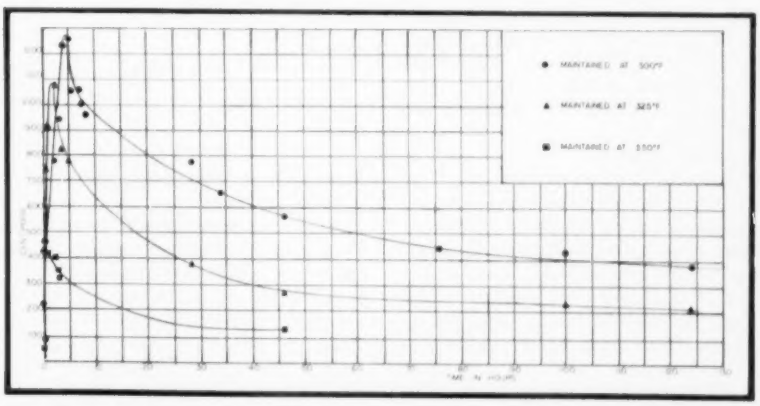
Three penetration grades of asphalt were used (40-50, 70-85, and 150-200 penetration), all prepared from California crude, along with 85-100 penetration asphalt prepared from Venezuelan crude.

A typical analysis of asphalts used in this study are shown in Table I. (See next page.)

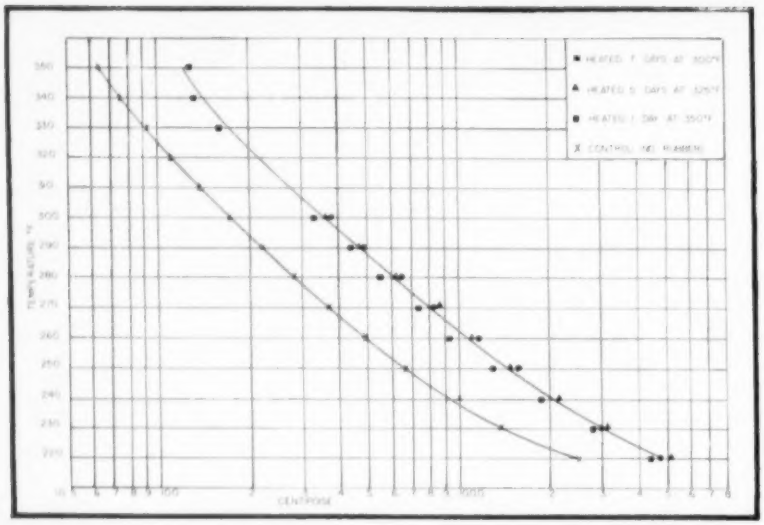
A brief outline of the procedure used is as follows: A beaker containing 400 grams of asphalt was heated to the designated temperature in an oil bath and 22 grams (5.5 percent) of rubber powder was added while the material was being agitated with a mechanical stirrer. Approximately fifteen minutes of additional stirring was required in order to equalize the temperature. The viscosity of the blended material was determined, using a Brookfield Viscometer, Type LVF. Stirring and temperature was then maintained for eight hours, during which time viscosity readings were made at various intervals. After the eight-hour period, there was no further agitation of the rubberized asphalt, which was placed in an oven set at the designated constant temperature. Periodic viscosity determinations were obtained at intervals up to 120 hours.

Figure 2 shows the viscosity changes of 85-100 penetration Venezuelan asphalt with the addition of 5.5 percent of natural rubber powder when heated at 300°, 325°, or 350°F. (149°, 163°, 177°C.) for various periods of time. Figure 3 shows the viscosity-temperature variations of these rubberized asphalt solutions after the prolonged heating cycle.

The advantages of using the Brookfield Viscometer over other



● **FIGURE 2. Viscosity of 85-100 penetration Venezuelan asphalt containing 5.5 percent of rubber powder as a function of various times and temperatures.**



● FIGURE 3. Viscosity-temperature variations of rubberized asphalt solutions containing 5.5 percent of rubber after various prolonged heating cycles.

standard viscosimeters are: Viscosity determinations can be obtained over a much wider temperature range; they can be obtained more rapidly; there is practically no loss of the material being tested and no clogging of the orifice due to undissolved rubber particles if present.

Comments

When mixing temperature was increased, in increments from 250° to 300°F. (121° to 149°C.), it was noted that recovered asphalt from rubber-asphalt mixes did not, at all times, follow the usual pattern of lower penetration as found in recovered asphalt from control mixes. In many cases the recovered asphalt from the rubber-asphalt mixes was found to have a higher penetration than the recovered asphalt from the control.

Penetration of recovered asphalt at 32°F. (0°C.) for all rubber-asphalt mixed at 280° to 315°F. (138° to 157°C.) shows an upward trend as compared to straight asphaltic control mixes.

Recovered penetration at 77°F. (25°C.) showed the average for all rubber samples tested to be higher than the average recovered penetration for the control.

It was found that control mixes showed little change in stability between 280° and 315°F. (138° to 157°C.)

All void contents on specimens tested were within the generally specified range of 3 to 5 percent.

Marshall flow values were within the generally accepted range of 0.10 to 0.15 inch.

It was noted in the rubber-bitumen blends that heating the rubberized asphalt for an extended period, after the rubber became thoroughly dispersed, showed little change in viscosity.

The test results from the laboratory studies, and from experimental pavements laid in the United States, materially aid us in our attempt to evaluate this new type of paving material. We now know that to obtain the best pavement performance less rubber should be used than was used in earlier experiments

The greatest increase in stability, of all types of rubber paving mixtures tested to date, was shown to occur when natural rubber powder was added at the rate of 4 to 6 percent concentrations. Recommendation for the continued use of 6 percent concentrations has been eliminated. It was found that the slight increase in stability, as compared to 4 percent concentration, does not justify the additional cost of the rubber powder. All other test results were about the same for 4 or 6 percent concentrations.

Our studies show that, in hot plant mixes, for best test results in stability, cohesion, etc., rubber should be added to the aggregate during the mixing process and not dispersed in the asphalt before adding same to the paving mixture. This situation may change as new types of rubbers become available for paving purposes.

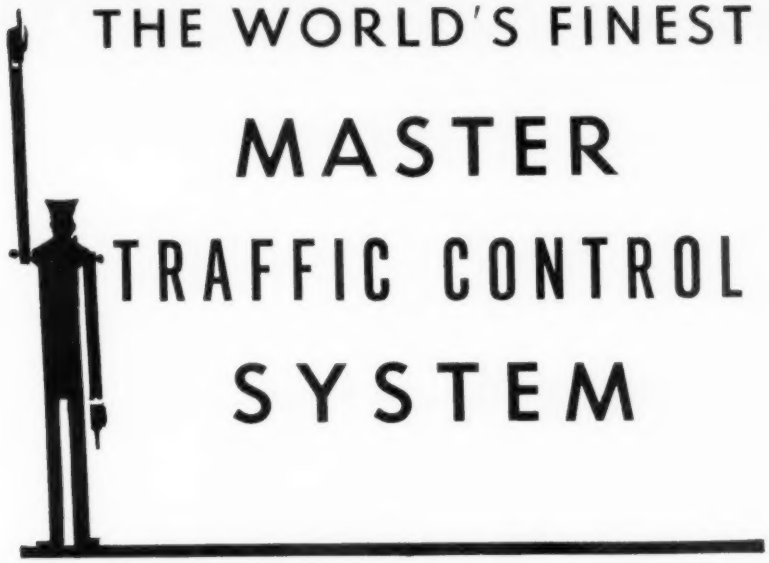
It was noted that there was little change in the ductility of the recovered asphalt by the addition of *natural rubber powder* to the control mixes. In all cases it was within requirements of specifications.

In addition to the types of rubber used in the above studies, other studies are under way on *new types* of both natural and synthetic powders, as well as studies on both natural and synthetic latex. Early results of these studies indicate additional improvement to the paving materials over previously tested types of rubber. These later results indicate probable additional future improvements in paving mixes as more information is developed on the subject.

The year 1954 sees many more states and cities using this new type bituminous paving material.

Table 1—Typical Analyses of Asphalts

		California	*Venezuelan*
	70-85	*150-200*	*85-100*
Specific Gravity 60°/60°F.	1.035	1.034	1.015
Penetration at 77°F. (25°C.)	81	175	90
Loss on Heating—50g. 5 hrs. at 325°F. (163°C.)	0.04%	0.01%	0.07%
Penetration of L. O. H. residue at 77°F. (25°C.)	77	166	81
Per cent of original penetration	95.06%	94.81%	90.00%
Ductility at 77°F. (25°C.)	150cm+	150cm+	150cm+
Solubility in CS_2	99.88%	99.90%	99.88%
Solubility in CCl_4	99.89%	99.83%	99.78%
Bitumen thus soluble	100.00%	99.97%	99.98%
Spot Test	negative	negative	negative



THE WORLD'S FINEST MASTER TRAFFIC CONTROL SYSTEM

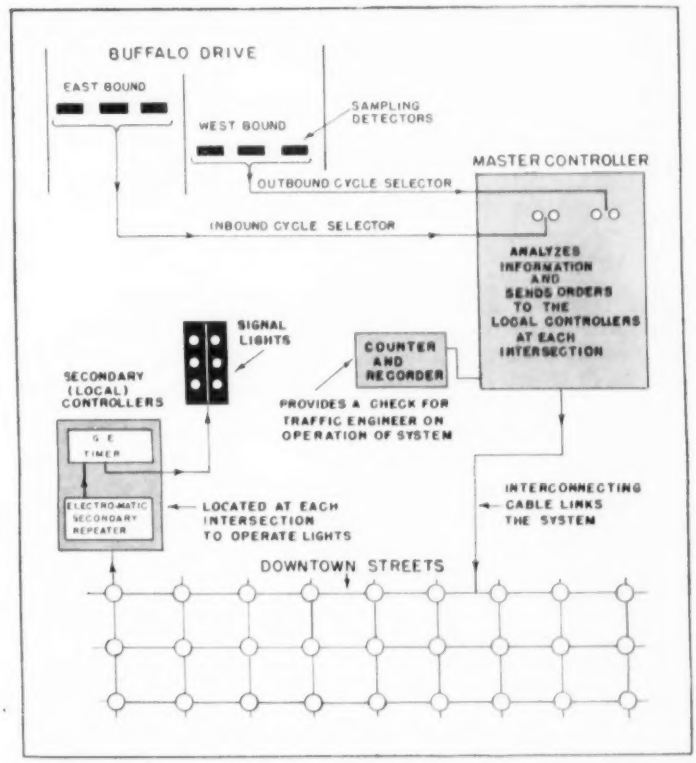
THE very latest development in central city traffic control was placed in operation in Houston, Texas, this summer. Mayor Roy Hofheinz threw the switch that put into operation the master electronic equipment controlling traffic signal lights at 289 intersections. Of these 135 are in the central business district, 97 are on feeder streets to the Gulf Freeway and 57 are on major thoroughfares leading into the business area. Houston claims this is "the world's finest master traffic control system". It was developed under the supervision of Eugene Maier, Director of the Department of Traffic and Transportation; installation was directed by S. R. Wilkinson, City Electrician; the master control equipment was furnished by the Automatic Signal Division of Eastern Industries; the variable frequency controllers at the 135 downtown intersections were made by General Electric.

The new system is intended to assure the maximum in safe and efficient traffic flow. A network of 33 miles of one-way streets is controlled by the new signal system. The combination of the electronic traffic control and the one-way traffic movements provide the maximum practical capacity on the roadways leading into and within the central business district.

An Electronic "Brain"

Actually the master controller is a super-minded electronic "brain" which has the know-how to see through its "eyes" the demands of traffic and accordingly relay orders to its "hands". In downtown Houston two main sets of detectors (the "eyes" of the master controller) are strategically located to take a sampling of traffic demands for the "brain" to analyze. This analysis is accomplished by electronic counting to determine the volume in each direction of the major traffic flows. But the Houston system also provides a switch in signal timing from progressive to simultaneous timing of the green lights as the traffic level builds up to a point at which the progressive timing will no longer give a smooth flow of traffic. The signal lights (the "hands" of the master controller) are on a "fixed time" relationship with what the master controller sees through its "eyes". Secondary controllers at each intersection are connected to an interconnect cable to receive cycle lengths and offset information from the master controller.

A check is provided to the Traffic Engineer and Maintenance Supervisor on inbound and outbound traffic at the sampling points (the information the system is working from) by means of counters, and the operation of the system is continuously recorded to insure that the proper cycle length is used in the timing of local controllers and that the correct relationship between adjacent signal lights is maintained.



● **SCHEMATIC** diagram shows how master traffic control system works.

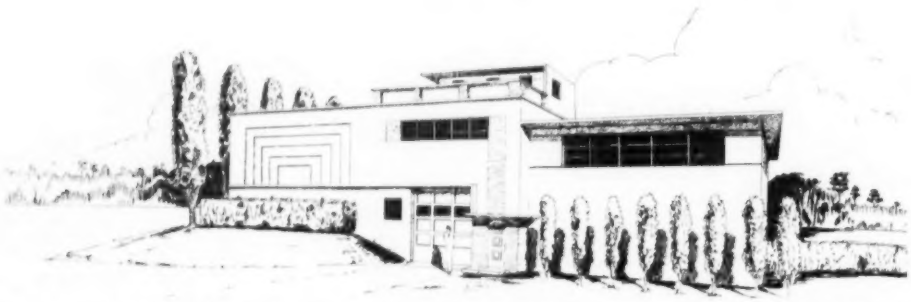
A special feature of this system is a new method of timing green lights whereby the cycle split or division of total cycles between the two streets may be varied from the master controller without changing the programming or interval dials of the local controllers. It is the first time this idea has been put into effect anywhere with this type of equipment. (*Turn to page* 96)

SOLVING···

SUBDIVISION WATER AND SEWAGE PROBLEMS IN THE MIAMI AREA

FACILITIES MUST KEEP PACE WITH RESIDENTIAL DEVELOPMENTS

● ATTRACTIVE sewage treatment plant for Miami International Airport utilizes high rate trickling filters.



● PLANT for treating Myrtle Grove sewage. Starting as a temporary plant for 80 homes, it now handles 1200.

C. E. WRIGHT

PLANS for eleven subdivision water plants and five subdivision sewerage systems in Dade County, Florida, outside the city limits of Miami were approved during 1953 by the State Board of Health. In addition, there were nine industrial or institutional sewerage systems, and eighteen school plants. To date 1954 has shown even more growth in this respect. These projects indicate not only the rapid growth of this area, but also show that the facilities of Dade County and of the twenty-six separate corporate communities included within its limits are unable to supply the need for water and sewerage services within the foreseeable future.

Some of the subdivision plants have required engineering and construction not only on a par with those for a small municipality but also with provision for economical expansion in order to provide capacity for anticipated stage development to serve several times the initial population. The Rader Engineering Co. of Miami has designed a number of these plants on an expansible basis to provide for such anticipated growth.

Eventually some of these subdivisions may become corporate entities. In such case management of these services may pass to municipal or other governmental authorities with control over a county-wide or district system.

Typical of some of the installations is that at Leisure City, a retirement village on the outskirts of Homestead, about thirty miles south of Miami. Here a raw patch of scrub palmetto land was selected by the promoters, who plan stage development, approximately 160 acres at a time, to provide for an ultimate population of between fifteen and twenty thousand persons. In order to insure economical development by stages it was necessary to make each stage self sufficient and to arrange for the conversion of the various units of the plants. The initial sewage treatment plant includes a circular Imhoff tank which will later be used as a digester, at which time primary settling tanks and trickling filters will be added to provide for the greater volume of sewage. Work is now under way on the third section of this development with a total of more than five hundred houses completed.

Engineering for such new developments calls for an entirely different approach than that for a new plant or an enlargement of an old

plant in an already existent community. Preliminary surveys and the drilling of test wells precede even the arrival of a bulldozer for land clearing. The site of another new subdivision, the Myrtle Grove Estates, northwest of Miami, on which twelve hundred homes will be built, was a farm. There were no markers on the property when the engineers first visited it to prepare for drilling a test well.

If real estate developers were able to persuade municipalities to extend water and sewer service to a site of a new subdivision, the developer's problems would be greatly simplified and their investment might in some ways be minimized. As this is usually out of the question, it devolves upon the developers to make an initial investment of substantial sums before they have sold a single house. Until quite recently, many developers depended upon the extremely permeable aquifer underlying the Miami region for individual water supplies and for the disposal of the household sewage by septic tanks and drain fields. The Florida State Board of Health has successfully fought for better sanitary control of such subdivisions with the result that a considerable amount of engineering planning is necessary before a subdivision can be approved.

Promoters of Myrtle Grove Estates, for example, desiring to hold down their initial investment for essential services, first suggested a temporary system for 80 homes. Preliminary plans were made for expansion by 300 home steps to provide facilities up to the full capacity of the development. Encouraged by the continuing demand for homes in the Miami area, Myrtle Grove Estates requested design drawings for water and sewerage systems for 300 homes, with plants capable of serving double that number. Three days before bids were due on these plants, it was requested that capacity be provided for the full 1200 homes; and now, before the first home is occupied, an expansion to include another subdivision in the same general area is being considered.

Each development poses its own problems and it has been necessary for Rader Engineering Co. to develop plants which may have some unique features, although standard equipment may be used as components. Since most of the subdivisions are in restricted space where the developers were reluctant to devote more land than is absolutely necessary for the sewage treatment plants, the proximity of homes makes it necessary to avoid unpleasant odors. To this end, it has been necessary in some instances to enclose odor-producing parts of the plant and to treat the air from the enclosed space. Conventional methods, either activated sludge or high rate trickling filter, may be used for the sewage. In general, provisions are made for withdrawing sludge into a tank truck within the building and disposing of it elsewhere. Water treatment may include the use of lime or alum for softening but frequently requires special consideration for the removal of color or iron. Color in itself is harmless but, because the appearance of the water may cause complaints or even induce people to use clear water from a questionable source, it must be reduced to comply with the standards of the Public Health Service.

Expansible Plants

In designing expansible type water and sewage plants, the Rader Engineering Co. figures that although it costs more to provide a plant for 3000 homes by constructing it in three stages than to build it initially with the ultimate capacity, there are factors of economy and efficiency which have to be taken into account. Few of the developers are so thoroughly convinced of their ultimate success that they are willing to invest the full amount at the start and moreover, plants built for 3000 homes would not be satisfactory while serving a small fraction of that number. By careful consideration of the adaptation of initial construction to the eventual plant the stage development programs have filled a need in the Miami area, where population growth in recent years has amazed even those perennial optimists, the members of the Chambers of Commerce. The 1950 census gave Dade County a resident population of just under 500,000. It is reckoned today as 600,000 or more, an average growth of about 25,000 a year.

Developments other than subdivisions have also had to provide their own water and sewer facilities. Such, for example, is the new Golden Gate Motel-Hotel development, a few miles north of Miami Beach, which is to be the largest in the United States, with several hundred rooms accommodating a total of 1240 persons. The site of this undertaking was in large part a mangrove swamp alongside State Road A1A, the ocean highway. As no municipal service was available in this area, other than a main from which wholesale water could be purchased, it became necessary for the Golden Gate's owner to provide for sewage treatment on his own grounds. This is a meticulous operation since living quarters are very close to the treatment plant and odors had to be kept from the guests of the motel units. Sewage is to be treated by primary settling in a Spirahoff unit followed by a high rate filter and secondary clari-

(*Continued on page* 133)

● **SEWAGE treatment had to be provided right on the grounds at the Golden Gate Motel-Hotel. Small circle shows location of plant, enlarged at the right.**

● **DEBRIS dumped by street sweeper onto the street surface is picked up by truck-mounted shovel and loaded into truck, all in one operation, at Amarillo.**

TRUCK LOADERS *Save Five Times Their Cost on* Street Cleaning Work

TRUCK loading attachments recently added to the street cleaning organization of Amarillo, Texas, are not only saving taxpayers thousands of dollars a year but are helping to keep the city spic and span. The machine is a Holmes Owen front end loader mounted on a Ford F-600 dump truck. With it, one man loads, hauls and disposes of dirt, trash and other debris that collects on city streets. Says Clifford L. Davis, Amarillo's City Personnel Manager:

"Two of these self-loading trucks have replaced a 15-man crew with five 4-yd. dump trucks that were previously required to handle sweepings collected from the 395 miles of curbing within Amarillo's city limits. The two trucks are equipped with 9-yard dump bodies specially built by the Hobbs Manufacturing Company. They need to work only eight or nine hours a day to keep up with the sweeping machines which are on day and night shifts.

"Although one man is all that is required to operate a truck and loader we have given each driver a helper. The second man directs traffic around pick-up sites in congested areas and handles final clean-up with broom and shovel. Even then we've cut labor requirements from 15 to 4 men, halved the number of trucks needed and eliminated many complaints about delayed pick-ups. The change-over to these self-loading machines has had wonderful public relation value.

"There is no way to determine the exact savings in reduced equipment investment and maintenance expense but they are considerable. We can pinpoint the annual labor savings at $27,000, nearly five times the cost of a truck and loader combined. To insure efficient operation of these trucks equipped with loaders we hand-picked two drivers from the 15-man crew who at various times operated these units over a two-week test period. The runners-up in this contest were assigned as helpers. After selection of the personnel to operate these units, we zoned the entire city and put each of the units on a regular work schedule. Downtown streets get a daily sweeping; however no street in the city goes unswept for more than eight days at a time.

"The first thing each morning the self-loading truck picks up debris collected during the night by three sweeping machines. Dump sites are marked with flares and listed on a report sheet given to each loader operator. This job is usually finished by the time the four day-shift sweepers have been out long enough to make one or two dumps. For the rest of the day each truck-and-loader collects the material dumped by two sweepers, the units often having time to work on other small projects."

Similar loaders are in use by, and are reducing the cost of many operations in such municipalities as Birmingham, Ala.; Chicago, Ill.; Charleston, S. C.; Kansas City, Mo.; Philadelphia, Pa.; Washington, D. C.; and Oakland, Calif.

Sludge Recirculation Gives Improved Water Quality

JOHN L. MONETTE
Assistant Water Works Superintendent
Pembina, North Dakota

THE water plant serving Pembina, North Dakota, is a conventional type plant with rapid mix, sedimentation, recarbonation, filtration and chlorination. This plant serves about 600 people, with average water production of about 50,000 gallons per day. The plant was reconstructed in 1949 with numerous improvements.

Treatment consists of softening, coagulation and chlorination. Lime, soda ash, sodium aluminate, ammonium sulfate, and chlorine (gas) are the chemicals used.

In the past the sludge was drained to waste. Last winter the sludge pipe was tapped and connected to a pump which delivers about 500 gallons an hour back into the mixing chamber. The re-use of this sludge has improved the water quality and operation at our plant. Our total hardness dropped from 130 ppm down to 98 ppm and our lime demand dropped about 10 pounds per hour, which saved about 90 pounds of lime per day.

We pump our raw water from the Pembina River which has a very high range of hardness throughout the year. We have tests showing calcium hardness 624 ppm, total hardness 976 ppm (this is during the winter), and alkalinity of 728 ppm. (*From the* Official Bulletin, *North Dakota Water and Sewage Works Conference.*)

Getting Water for Philadelphia

SAMUEL S. BAXTER,

Water Commissioner, Philadelphia, Pa.

This is a portion of a paper by Mr. Baxter before the Hydraulic and Sanitary Engineering Division joint sessions at the Atlantic City meeting of the American Society of Civil Engineers.

At the present time, the Philadelphia Water Department is actively pursuing the internal improvement program recommended in the 1940 and 1946 reports of Boards of Consulting Engineers. This program, which was seriously delayed by war and financial difficulties until 1950, provides for complete modern treatment facilities at all of our Water Department installations.

The first step in the improvement of treatment came with the completion of the construction of the new ozone plant at Belmont Filters in 1949. This provides modern treatment facilities for a flow of 36 mgd, approximately half of the water treated at this plant which has a capacity of 70 mgd.

The second stage of the program began in late 1949 with the start of a new chemical pretreatment plant at Queen Lane Filters. This installation, which will go into operation this fall, will provide improved sedimentation and flocculation, together with the best modern devices for feeding chemicals. The work will include the reconstruction of existing filters at this plant. This phase, which cannot start until the completion of the pretreatment plant, is now in the contract drawing stage, and construction work will begin in 1955. The net result of these improvements will be to increase the average capacity of the Queen Lane Treatment Works from 100 mgd to 120 mgd and to improve quality control.

The next contemplated step in the improvement of water quality is the construction of a complete new treatment plant at Torresdale, which now handles half of the City water supply, an average of 200 mgd. This new plant will have rapid sand filters in place of the old slow sand filters, now almost fifty years old; and completely new chemical treatment facilities. Bids for the first contracts, which include the sedimentation and mixing basins, were received early this summer, and completion of construction is planned for the end of 1957. When this plant is completed, and some additional pipe lines constructed, it will be possible to abandon Roxborough Filter Plant on the Schuykill River, which now treats about 25 mgd.

The new plant at Torresdale is designed to produce 282 mgd, using a filter rate of 2 gallons per square foot of filter area, with a 50% overload capacity of 423 million gallons daily. This new plant will not only provide better treatment, but will also produce more water than the present plant. The existing plant runs at peak load during the extreme hot periods in the summer. The increased capacity will afford a better margin of safety for present demands, and will also provide capacity to meet new demands in the area served.

The final step in the improvement of the treatment facilities is scheduled to begin in 1957, with the construction of additional rapid sand filters and chemical treatment facilities to treat the balance of the water at Belmont Filter Plant.

Much is expected from these modern treatment plants. They will definitely provide for the elimination of many tastes and odors, which, although occurring at infrequent intervals, are a source of annoyance to Philadelphians who must use this water. All of these facilities should be in operation by 1960, with some of them scheduled for earlier dates.

The length of time which these new treatment plants will permit Philadelphia to continue to use its existing sources depends upon sev-

● **TORRESDALE** filtered water pumping station. Old plant, which uses slow sand filters, will be replaced with new rapid sand plant with capacity of 282 to 432 mgd.

eral factors. It will be assumed here that sufficient quantity exists in the two rivers opposite Philadelphia to provide for increased usage. This increase will be affected by growth of population within the city, increased per capita consumption, increased use of water for air conditioning and possible requests for use of Philadelphia water outside the city limits. In general, the new treatment plants provide for this increased capacity, which will also have to be taken care of in the pumping and distribution systems.

Future Water Use

Some of the qualities in the raw water affecting future use of the Delaware River are:

1. *Effect of the 40-ft. channel from Philadelphia to Trenton:* Business interests in the Delaware Valley are pressing actively for the construction of a 40-ft. deep river channel from Philadelphia to Trenton. This channel is required at the present time primarily for the new U. S. Steel plant at Morrisville. Its construction, however, is bound to bring new heavy industry along that portion of the river above the present Philadelphia water supply intake at Torresdale which is within the city limits. If this 40-ft. channel, or even the 35-ft. channel which is being discussed as a compromise, is built within the next few years, there is the definite probability that heavy industry will build along the river. There is also the definite probability that these industries will produce waste of the type which cause tastes and odors in water which are difficult to eliminate, even with the best of treatment processes.

Both Pennsylvania and New Jersey have adequate anti-pollution laws, and new industrial plants provide facilities which treat such wastes. Despite the best of care, however, wastes have been discharged, due to carelessness or accident, which cause obnoxious odors and tastes. Within the past two years, the Torresdale Plant has had to combat two large spills of cyanide above the plant, and at least a half-dozen excessive phenol spills.

The type of new industry which will follow the deeper channel and experience with wastes from these industries will have a definite effect in fixing the time when Philadelphia must abandon Torresdale on the Delaware River as a source of supply. Prior to the advent of the steel plant at Morrisville there was little shipping on the river above the Torresdale intake. The steel plant, and other new industries, will bring additional shipping. Pollution from this shipping, particularly bilge pumping, may be a source of trouble.

2. *The effect of sewage treatment projects:* The dumping of Philadelphia sewage into the river opposite the city has been a definite source of pollution in the past. In recent years, very little of this sewage has reached the Torresdale intake except under unusual tidal conditions. Two years ago, the new Northeast Sewage Treatment Works began operation, and the new Southwest and Southeast Plants in the southern part of the city will be in operation within two years. Although the effect of these treatment plants on the condition of the river can be estimated, actual experience will be required to determine how much effect the operation of these plants will have on the quality of water at Torresdale.

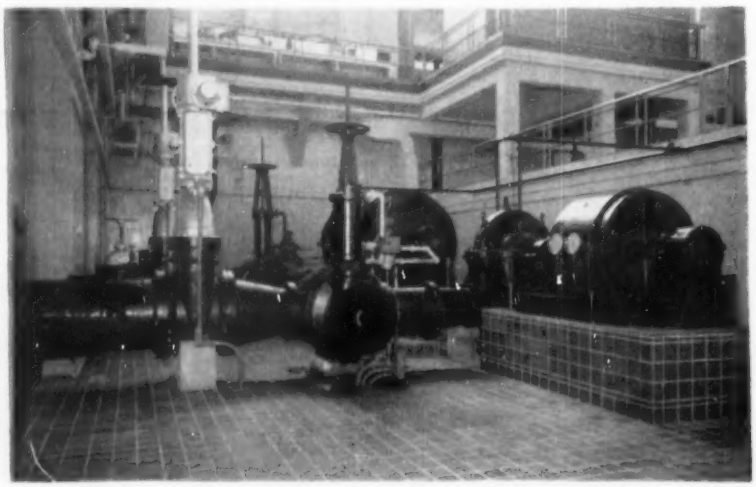
Finances

3. *Financial considerations:* The construction of new upland sources will involve expenditures of very large sums of money. The costs, adjusted to today's prices, range from $150,000,000 to $400,000,000. Philadelphia's Water Department is now operated on a completely self-sustaining basis. All of the expenses of the Department, including debt charges, must be met by water rates. Rates are established by the Water Department to meet existing budget appropriations. In 1953, rates were increased in amounts ranging from 31 percent to 55 percent in order to put the Department on a self-sustaining basis, to permit operation at modern standards, and to pay the debt charges on the new work now under construction, and on existing debt.

The cheapest of the plans suggested for upland use, which would take water from the Delaware River at Yardley, would result in a minimum increase of 50 percent above the new rates. The more elaborate schemes, involving transmission of water from Wallpack Bend by conduit to Philadelphia, would increase rates to two and one-half times the present scale.

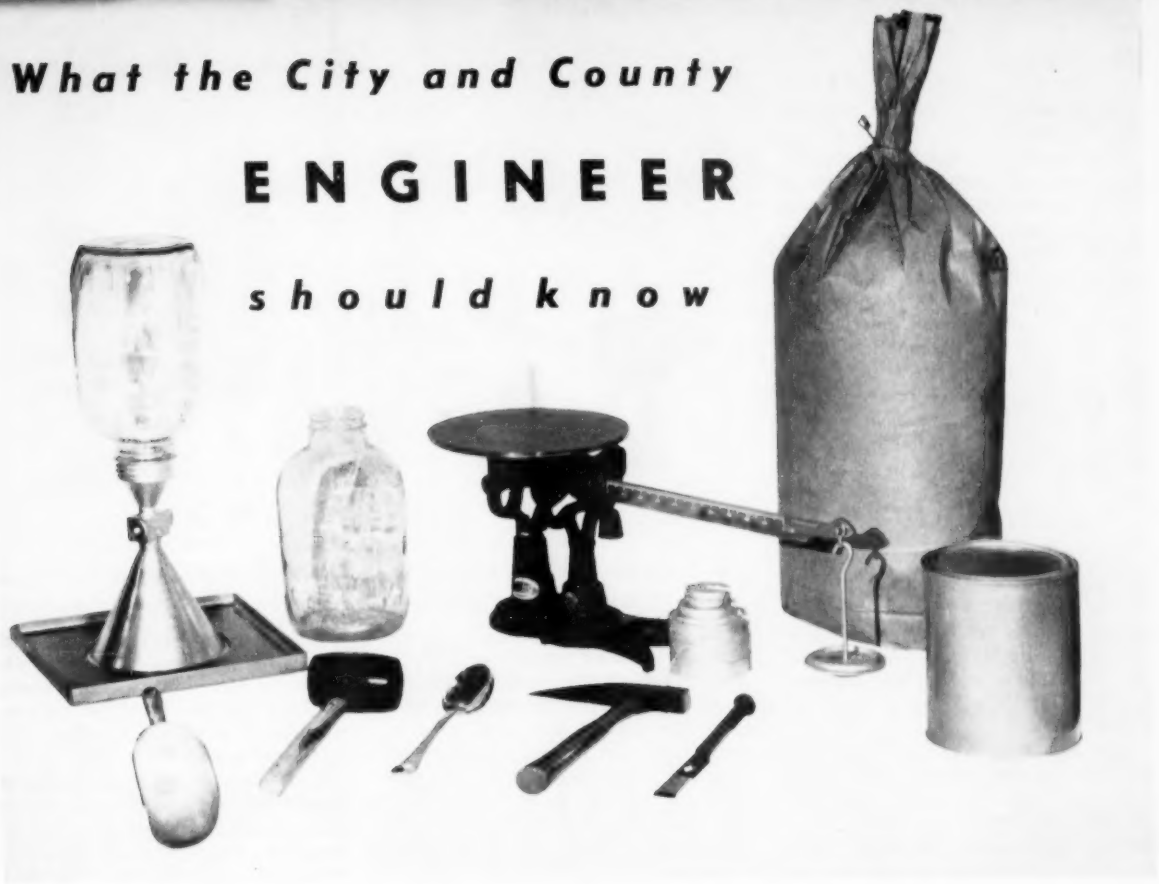
4. *Aesthetic considerations:* The desire of the people to obtain water from uncontaminated upland sources, rather than from nearby contaminated sources, cannot be overlooked. This desire is present, even though the upland source may be subject to contamination, and despite the high quality of water which may be produced from nearby sources. The future will have to determine whether Philadelphians are willing to pay the increased costs for an upland supply, especially if the new treatment plants now under construction eliminate objectionable tastes and odors, and continue to produce good water.

5. *Use of Schuylkill River:* At the present time, Philadelphia contains approximately 200 mgd from the Schuylkill River, within the city limits. Although this river has been cleaned up appreciably within the past few years, its continued future use cannot be guaranteed. It cannot be counted upon for any additional quantity above that which is now taken. Above Philadelphia, there are many small cities and towns, and considerable industry. The length of time which this river can continue to be used, has a definite effect on the future use of the Delaware River.



● **INTERIOR view of Torresdale filtered water pumping station, showing pumps, valves and piping. New and larger plant will be completed within next two years.**

What the City and County ENGINEER should know about SOIL INVESTIGATIONS



An Outline of Apparatus and Procedures

M. D. MORRIS

Eastern Representative, Soiltest, Inc.

(Illustrations courtesy Soiltest, Inc.)

SUBSURFACE investigation is literally and figuratively basic to the business of building. Regardless of the project, it is economical and efficient to know exactly upon what a structure is to be built.

A well-ordered soil investigation consists of three phases: (1) the taking of good samples; (2) the making of appropriate tests from these; and, (3) the correct interpretation of the results.

To an average county or city engineer operating on today's budget, this might seem like so much window dressing; but the advantage of knowing the substrata, and being able to predict their behavior will return value far in excess of any expenditure for a soils engineering program. The following material will suggest the necessary equipment for operating such a program on any one of several levels of budgetary allowance. All dimensions and all prices given are approximate.

I—Sampling

The quality of the sample immediately determines the quality of the entire investigation. Test pit sampling is by far the most accurate method of sampling soils, though its cost is often excessive, especially for deep pits. In test pits it is possible to see the soil at its natural moisture content, and also to observe the stratification in the soil; both are often useful for correlating soil data from various portions of the structure. In this method of sampling, usually a cube sample approximately 12 ins. on a side is obtained by trimming around 5 sides of a cube, placing a box on top of the cube, and then digging beneath the cube to place the soil into the box. Paraffin is then added to preserve the natural moisture content of the soil. This method is fully described and specified in the American Society for Testing Materials (ASTM) procedures for the Engineering Testing of Soils, 1944. No special equipment is needed for this test.

The use of auger equipment is subject to various difficulties. The samples obtained are never in a completely undisturbed state. It is impossible to auger through sand below the water table without the use of casing or drilling mud, thereby rendering the method often more expensive than the so-called undisturbed sampling method. Penetration through large gravel and boulder strata, hard pan and, of course, bedrock are almost impossible with auger equipment. Samples from below the water table are such as to prevent reasonable identification of the material as it exists in its natural moisture content in the soil. Thus auger samples are to be used only as the economics of the problem warrants. Probably the most important single place in which auger sampling is useful is in ob-

taining samples of borrow material for compactive fills. Here the natural state of the soil is not critical, and only the approximate natural moisture content must be preserved.

Auger equipment ranges upward in size from hand augers which are designed for easy and rapid advancement of shallow exploration holes. An auger which makes clean round holes in wet or dry soil, is easily emptied, and takes up stones in gravelly soil, is furnished with 3-foot extensions and a hardwood cross handle. It is available in non-adjustable sizes from 2 to 12 inches in diameter. The cost ranges from $6.50 for the 2-in. to $12.50 for the 12-inch.

Useful accessories for this outfit include auger extension sections, 36 inches long; and an adjustable extension handle which permits hand boring to a depth of 10 feet without the necessity of adding and removing sections. The cost of these is small.

For somewhat more varied, but still elementary, boring there is a soil sampling kit which contains everything needed to obtain accurate subsurface information. The complete set is light enough to be carried easily in a jeep, by pack animal, or by two men on foot. Included are twelve different earth and soil tools that can be used to recover samples from practically any material. All tools are fitted into a steel carrying case. With this, the exploration hole can be driven to a depth of about 28 ft. The shipping weight packed is 205 pounds and the cost $240.

If mechanical aid is desired (and the savings in man-hours will soon pay for this) a 7.5-hp gasoline engine driven auger is available which may be used to sample to depths close to 30 feet. This auger is most useful in obtaining preliminary subsurface information in remote areas and for preliminary road and land slide investigation, etc. The motor and drill unit weigh 79 lbs. and the cost is $460. The auger blade is 6 ins. in diameter and 3 ft. long.

The most widely used and nearly perfect method of sampling is the one incorporating drilling equipment and thin walled or thick walled sample tubes. Here, a small diameter hole is drilled to the upper sampling elevation by rotary drilling equipment, chopping bits, or clean-out augers. Any method that provides a reasonably clean hole prior to the placing of the sampling tube at the bottom of the boring is satisfactory. Special precautions must be taken, of course, to keep the hole open by the use of drilling mud or casing, but the casing should never precede the sampling in the drill hole. After the drill hole is cleaned to the proper elevation, a sampling tube is inserted into the hole and either driven or pushed into the soil. The tube of soil is either classified and placed in a jar at the job site, or the tube is hermetically sealed and shipped to a laboratory for further tests.

● **FIELD COMPACTION** kit provides a complete set of equipment for determining maximum density-optimum moisture curves in either the field or the laboratory.

The two sampling methods most frequently used in the United States are the Shelby tube and the split spoon method. In the Shelby tube method, a thin walled tube from 2 to 5 ins. in diameter is pushed into the soil continuously and rapidly. On removal at the surface, the ends of the tube are sealed with paraffin and the tube is shipped to a laboratory for testing. This method provides a reasonably undisturbed sample which has been found to be suitable for most engineering tests.

With the split spoon method, a thick walled steel tube is split, then rejoined by a coupling at each end, and driven into the soil by successive impacts from a hammer dropped a given distance. Penetration is obtained by means of the impact and the number of blows is often useful in classifying the material sampled. Both these methods are described as to apparatus and procedure in "Suggested Method for Thin-Walled or Split-Tube Sampling of Soils," ASTM D-18-R2-Section B.

The Shelby tube method has been found most useful in sampling clays and silts, since the samples obtained can be shipped to a laboratory and tested to determine density for a silt and consistency for a clay. Split spoon sampling is generally employed in sands and gravels to obtain a relative density of the material by counting the number of blows required to drive the sampling tube down one foot.

For this type of work a city or county engineer office could operate with a heavy duty hand sampling kit intended for sampling soils to depths of approximately 30 feet. The kit is designed for operation by hand. All equipment and fittings are standard so that additional equipment to sample at greater depths can easily be added. All equipment in the set can be used with any of the standard drill rigs when power is desired. Weight is about 750 lbs. and cost about $1050. Equipment for this type of sampling is as follows:

One 12-ft. tripod; one 100-lb. hand

● **POCKET** penetrometer can assist in field classifications of cohesive types of soil samples.

drive weight; drive pipe assembly; ⅞-in. manila rope; 32-ft. of drill rod; hoisting swivel; cross and straight chopping bits; split spoon sampler; water swivel; suction and pressure hose and fittings; centrifugal pump; thin wall sampler tube head and 20 extra tubes; 8-oz. sample jar; paraffin and paraffin equipment; tool kit and wrenches; 15 ft. NX casing, with drive head and shoe; and hand auger and extension.

For power drilling, two drilling rigs are suggested for 100-ft. and 200-ft. depths. The list of equipment for the 100-ft. deep kit is as follows: A 16-ft. tripod; 110 ft. of A rod; one fish tail and one straight chopping bit; all needed couplings; 100 ft. of casing with drive shoe and coupling; 140 and 340-lb. drive weights for sampling and for driving; split spoon and thin wall tube samplers; hoisting tools; hose; sampling and sample preparation tools; tools and hoisting lines; and coring equipment. The shipping weight of the 100-ft. kit is 2800 lbs. and the cost $1500. The 200-ft. kit, essentially similar in nature, weighs for shipping 4200 lbs. and costs $2700. Drill rigs can be furnished truck mounted for full mobility.

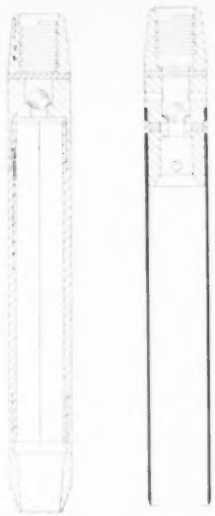
A pocket penetrometer is a time-saver in the field and for rapid soil classification, though it is not a precision instrument. It weighs less than a pound and costs $15.

Care should be taken to be sure that an "undisturbed sample" taken in the field reaches the laboratory in that condition.

II—Testing

The laboratory is the place where samples tell their story. What tests for general or specific purposes should be made are best determined by the engineer on the basis of the project and the facts he must know. For this purpose a bibliography is listed near the end of this article. Below are listed the minimum requirements to perform basic soil tests under the average budget of a County Engineer.

Minimum Laboratory—For standard compaction, unit weight, moisture content and strength estimate: One 1/30 cu. ft. compacting mold; compaction hammer; straight edge; mixing trowel; mixing pan; triple beam balance; 35-lb. by 0.01-lb. scale and 3 doz. 3-oz. moisture cans.



● **SOIL samplers include split tube (left) and thin wall types. Outside diameters range from 2 to 5½ inches.**

For field density, maximum-minimum, there will be required in addition: One sand cone apparatus; field plate; density spoon; 3 field cans; chisel; rubber mallet; 100 lbs. Ottawa sand; a Test Manual and a pocket penetrometer.

The cost of the above equipment is about $260. In addition to the above, it is recommended that the following be included: A liquid limit set ($55); a plastic limit set ($7.50); and a shrinkage limit set ($13). For grain size determinations, a set of fine sieves, a set of coarse sieves, a hand type sieve shaker and a sieve pan and cover will be needed. The complete set costs $190. A set for hydrometer analysis lists at $70.30.

This minimum laboratory equipment can be extended to provide for sampling preparation—a triple beam trip scale of 1610 grams capacity, a soil mortar and pestle, a wire saw, sample jars and a complete soil sampling kit. The list on this is $280.60.

To complete the basic laboratory for strength tests, etc., will require about $400.

Again this is all basic and to it may be added more advanced apparatus such as direct shear from $500 to $900; consolidation from $300 to $1100; and triaxial with all its refinements (pore pressure, etc.) from $300 to $3000. And for about $14,000 a complete mobile laboratory in a panel truck can be had.

III—Use of Test Results

All test data end in graphic presentation which indicate definite things. The most careful sampling and the finest testing go for nothing if the end results are not interpreted properly and put to use in the design, and in construction control. This is a function of the supervising engineer. To help him many excellent standard texts have been published, to mention a few:

Theoretical Soil Mechanics. Karl Terzaghi; 510 pages; 1943; $6.75.

Soil Mechanics in Engineering Practice. Karl Terzaghi and R. B. Peck; 566 pages; 1948; $6.75.

Fundamentals of Soil Mechanics. Donald W. Taylor; 700 pages; 1948; $7.25.

Soil Testing for Engineers. T. William Lambe; 165 pages; 1951, $5.25.

Soil Mechanics. D. P. Krynine; 450 pages; 1947; $7.25.

Soil Mechanics, Foundations and Structures. G. P. Tschebotarioff; 655 pages; 1951; $7.75.

Laboratory Manual in Soil Mechanics. Raymond F. Dawson; 235 pages; 1949; $3.75.

Introductory Soil Mechanics and Foundations. G. B. Sowers and G. F. Sowers; 320 pages; 1951; $5.50.

Foundations of Structures. Clarence W. Dunham; 679 pages; 1950; $8.25.

Applied Sedimentation. T. D. Trask; 707 pages; 1950; $7.00.

Nature and Properties of Soils. Lyon, Buckman and Brady; 499 pages; 1952; $6.50.

Fundamentals of Soil Science. Millar and Turk; 484 pages; 1951; $6.00.

There is also a fine British book called "Soil Mechanics for Road Engineers". Of the many pamphlets, the two most useful are the Soil Primer of the Portland Cement Association; and Technical Bulletin No. 107, (1946) "Soil Tests for Military Construction" by G. E. Bertram from the American Road Builders Association.

● **LABORATORY equipment at right includes apparatus for performance of basic engineering soil tests.**

PARK RIDGE cuts Repaving Costs

PHIL HIRSCH

USE OF A concrete saw on an extensive street repair job saved Park Ridge, Ill., more than $9,000, according to Walter Hein, engineer for the project. The work involved removing a cracked pavement section on about 17.5 miles of residential streets in the city. The saw, made by Clipper Mfg. Co., was used to cut away the damaged sections of the pavement to permit removal and replacement.

The streets involved in this reconstruction project were about 25 years old. The concrete wearing course, which was 6 to 8 ins. thick, had been laid on an existing soil subgrade. Over the years, surface water had seeped through the joints and under the slabs; subsurface drainage was inadequate; and leaky sewers, and in some cases water mains, had contributed to the moisture in the ground. Due to inadequate support and to winter freezes, many cracks had appeared, mostly in the center of the street. As time went on, sections of the pavement failed under the pounding of traffic and there were potholes which, in some places, were several inches deep.

Eventually the streets were in such bad shape that Park Ridge motorists began complaining bitterly about them. In addition to the holes, shifting of the pavement had created bumps. These, with the cracks and the potholes, made driving uncomfortable and at times downright dangerous.

Removal Methods

Three methods of removing the sections cracked beyond repair were considered: (1) Using air hammers to break up the damaged pavement; (2) employing a combination of air hammers and a concrete saw; and (3) filling the cavities under the slabs by pumping in grout to bring the sections up to grade.

The first method was found to be considerably more costly than the second. Removal with air hammers alone was estimated to cost 20 cents per foot of pavement or 10 cents per foot of cut, since it was necessary to take out a section along the centerlines of the streets. But if the pavement was cut first with the concrete saw, removal by air hammers would be only half as much. Since the work involved about 92,400 ft. of pavement, this represented a saving for the second method of about $9,240. Jacking up the pavement slabs by pumping grout under them was turned down because, due to local conditions, it was felt that there was no assurance that all of the rough places would be removed by this method of procedure.

The saw used for the work was of the rotary type with a diamond mounted abrasive wheel or saw about 12 ins. in diameter. This cut a groove about one-fourth the depth of the pavement, which in this project indicated a depth of about 2 ins. A blade could cut from 2500 to 4000 ft. before wearing out. After the cut was made, air hammers were used to break through the remaining concrete. With the preliminary saw cut, it was possible to break the concrete to a straight line. This saved money because a minimum of pavement had to be replaced; and it left a straight, clean edge to be patched, assuring a good bond for the replacement material and a neat appearing job, and eliminating the chance of further damage to the pavement because of future seepage of water to the subbase.

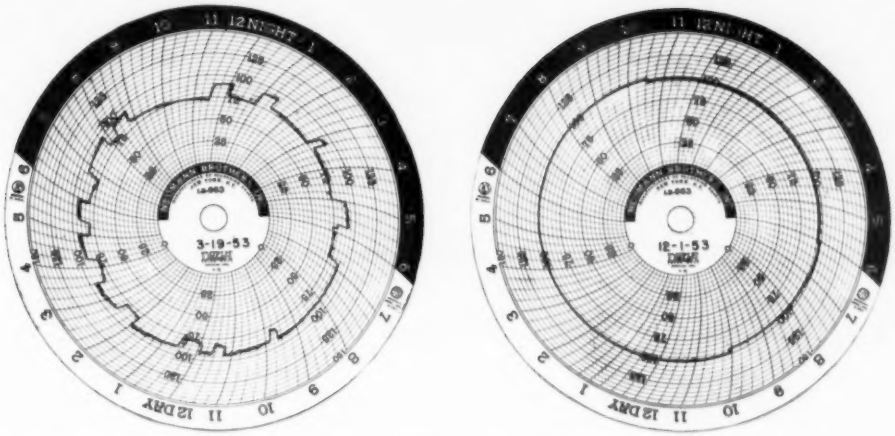
Since most of the cracks and broken areas were at the crown of the street, the cutting operation had to be planned carefully. The problem was to remove a minimum amount of pavement so as to reduce the problem of replacing the crown at the proper contour. For the most part, the cracked sections were not more than 3 or 4 feet wide, so the problem was solved by cutting equal widths from either side of the center line.

After the cracked sections were removed, the sub-base was repaired and leveled, and all water or sewer leaks were remedied. The holes were filled with cement concrete forming a new base and a final surfacing of blacktop 2½ ins. thick was placed.

The contractor was able to remove and pave about 500 sq. yds. of streets per working day. The total cost of the project was approximately $350,000.

● CLEAN and sharp edges obtained by using concrete saw cost less and permit better bonding with the new surface.

● CONCRETE saw was used to make pavement cut to permit removal of damaged sections before construction.



● **ACTUAL** recordings of average daily conditions before and after the automatic control system was installed show how much the stability of the pressure was improved. Electrical controls can and will sense variations and operate equipment more efficiently and accurately than can be done manually. Note dates on charts.

AUTOMATIC CONTROLS

IMPROVE WATER SUPPLY SERVICE

With fire protection paramount in a design of a water distribution system, the Carroll, Ia., water supply control system provides the equivalent of three feet of extra elevated tank storage, saving some fifteen thousand dollars in tank costs, plus much improved pressures throughout the city.

RECENT improvements have been made to the water supply system of Carroll, Iowa, which now consists of four deepwell pumps which discharge into a main 50,000-gallon reservoir; and three high-service booster pumps, which pump water from the reservoir through approximately 2 miles of city main to a 500,000-gallon elevated tank. Distribution mains for the city of Carroll are connected to the main supply line between the booster pumps and the elevated tank.

Because of this large intermediate draw-off and the great distance between the pumps and the elevated tank, local control at the pump station was considered almost impossible. At best, it would be inaccurate even with considerable human supervision. Both problems were solved by engineers of the Automatic Control Company with a simple and foolproof telemetering system. The transmission scheme of this system is so simple that any operating personnel who are familiar with an electrical relay can do whatever maintenance is necessary. Actually, there is very little maintenance work required, for, like an electrical relay, it has few moving parts. With such simple design, maintenance has been reduced to little more than routine inspection.

This automatic control system serves: 1, to maintain the water level in the reservoir between an upper and lower limit, by starting and stopping one, two, three or all four of the well pumps in the wellfield; and 2, to maintain the water level in the elevated tank between the low and the high level by starting and stopping combinations of the high service pumps. The control equipment has a secondary function, that of sounding various alarms, under emergency conditions such as high or low reservoir level; low level in the elevated tank; failure of well pumps to start when called for; or low distribution main pressure.

How the System Operates

The various control components which make up the system and their locations are as follows: At the elevated tank is a transmitter and pressure sensing device. At the main pumping station is the large receiver-retransmitter. At the main reservoir is a multiple-circuit, float operated transmitter. At each deep well pump is a separate receiver for the operation of that particular pump. At the fire station is a pressure sensing alarm unit.

Here's how the system operates: To maintain pressure in all parts of the system and to provide adequate storage, it is desired to keep the water in the elevated tank at a given high level. This is the job of the pressure sensing unit installed at the base of the elevated tank. As water is withdrawn, the pressure unit senses the change. It then causes its self-contained transmitter to send a signal to the main receiver-retransmitter indicating the need for a pump to operate. The main receiver then operates one of the high service pumps until the water in the tank is restored to the high level. When this level is reached, the pressure unit interrupts the signal stopping the pump.

Should the water in the elevated tank be withdrawn at a greater rate than one pump can replenish it, the transmitter calls for additional pump capacity. The main receiver responds by bringing additional high

service pumps into operation until all the pumps, if required, are operating. As the water level comes back to the high level, the transmitter relays this information back to the main receiver. The main receiver then shuts down the high service pumps in a prescribed sequence. Also should its incoming power supply fail, the elevated tank transmitter sends a warning signal to the main receiver to operate an audible and visual alarm and also signals the alarm device located at the fire station.

The float operated transmitter at the reservoir performs several important functions. As the water in the reservoir is withdrawn by the high-service pumps, the transmitter sends a signal to the main receiver. This signal is then sent to one of the deepwell pump receivers, which in turn puts its pump into operation. Should the water in the reservoir be withdrawn at a greater rate than the one well pump can supply, the transmitter calls for additional pump capacity. In turn, the main receiver continues to bring in additional pump capacity until the demand is satisfied. As the level in the reservoir rises, the extra well pumps are stopped and only one pump runs until the water reservoir is at the high level. The last pump is then stopped.

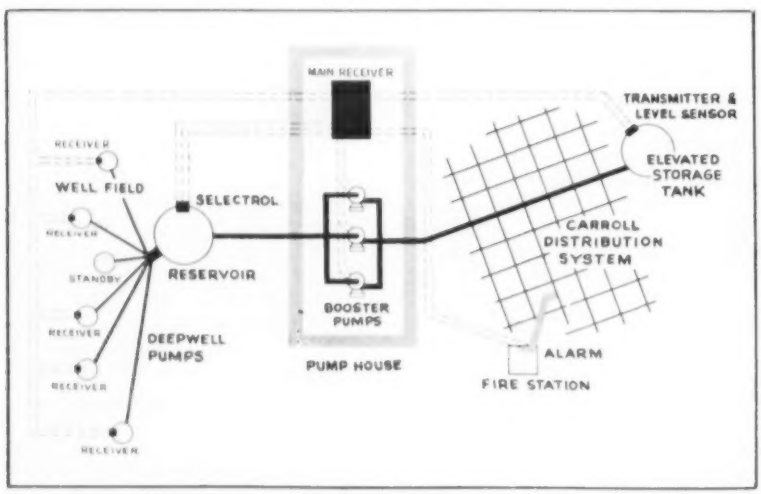
If for any reason, such as a short circuit, the pump should continue to operate after the high level point of the reservoir is reached, the transmitter sends a signal to the main receiver which sounds its self-contained audible and visual alarm and sounds the alarm in the fire station.

The same alarm action takes place should the water in the reservoir reach a pre-determined low level. If the water is withdrawn below this point to an extreme low level, a signal is transmitted to the main receiver which shuts down the high service pumps and locks them out until a suitable high level has been restored.

Because of their scattered locations each deep well pump operates as a completely unattended station. With this Autocon system, daily inspection trips to check operation of equipment are completely eliminated, and system personnel are free to do other more productive work. As each deep well pump is brought into operation a pressure sensing unit checks operation of the pump. If water is not discharged after a short time interval, the pump is shut down and a signal is sent to the main receiver-transmitter which lights a warning light and sounds an alarm. If operation of the pump is normal, a signal is sent which illuminates a "pump running" lamp.

From the foregoing description of operation it would appear that the receiver-transmitter is the king-pin of the system; but this is not the case. It merely receives intelligence in the form of signals from all parts of the system, and relays the information to the proper combination of pumps or alarms. The important units are the primary control devices. These are actually responsible for anticipating what type of operation is needed for any given system condition. Because of its location in the main pump house, the receiver-transmitter is equipped to advise personnel of the condition of the system. It also permits complete manual control of any or all parts of the system. It has 7 manually operated transfer plugs so that the sequence of operation of the well pumps may be changed as often as desired. It has automatic selector switches for each high service and deep well pump to permit testing or servicing. It also has an automatic alternator to change the starting sequence of the two smaller capacity high service pumps. Green "pump required" and red "pump running" lights as well as red alarm station lights are included in the front panel of the unit.

Because all things electrical or mechanical, no matter how well they are constructed, may at some time fail, an additional alarm device for this system has been provided. Through a connection in the main adjacent to the fire station a pressure sensitive control unit senses a drop in system pressure and sounds an alarm in the fire station. With this unit there is assurance of sufficient water pressure in the mains for fire fighting or other emergency conditions. As a secondary precaution this alarm unit in the fire stastation is sounded whenever the alarm station at the main pump house is sounded.



● **WATER from wells, left, flows to nearby reservoir; electrically controlled pumps deliver to system according to elevated tank level.**

In this system, DC is used for all signal transmission. Reasons for this choice are many. Most important is the fact that DC permits induced voltages to be bled off, it reduces capacitance effects and permits the faithful transmission and reception of all signals. It also permits the use of leased telephone wire which eliminates line maintenance by water system personnel.

● "WALK On The Green" idea in operation. Pedestrians cross on the green light on a wide band of bright green.

Bright Green Markings Control PEDESTRIAN TRAFFIC

Captain LLOYD H. STOREY

Traffic Department,

Michigan City, Indiana

EVERY summer Michigan City faces a population jump of nearly 100 percent. A normal manufacturing town becomes a lakeside resort and the population jumps from 40,000 to about 80,000 people. The result is confusion and sometimes chaos in the downtown shopping area.

Like most normal people the vacationers tend to live a little faster and have less regard for the rules and regulations of the people around them. They put more zip in their driving downtown, jack-rabbit away from stop lights with more intensity, and seem to have a running race with pedestrians trying to cross the street. And once their cars are parked, many people take the philosophy "Let's get there fustest with the mostest". Jaywalking, crossing against lights and other like things become the rule rather than the exception.

Mayor Russell Hileman and myself, working on the problem over the years, have developed steps to control both motor and foot traffic. Controlled speeding zones and well-placed stop lights have slowed down the motorists, but there aren't enough hands or feet to stop every pedestrian. We have used most of the familiar devices, including the WALK-WAIT signals, sound truck system, and warning tickets.

This year we seem to have found an unusual and simple system which creates an impression upon the pedestrian and motorist alike.

The mayor first explained his idea to me last spring. Together we reviewed our present pedestrian traffic control. We had stop lights at every intersection in the downtown area. We had recently installed a new WALK-WAIT system using the green WALK sign and a red WAIT sign. The WALK flashed long enough to allow people at either corner to cross and then the WAIT came on allowing motorists to make either a right or left hand turn. However, people continued to disregard the WAIT and attempted to make a crossing after it flashed red. We still needed a better system to control pedestrian traffic.

At most intersections throughout the country safety zones are defined by two white stripes usually about 8 feet apart running across the street. A person crossing is supposed to use only these areas at every corner. The motorist is supposed to keep the nose of his car out of this area when he stops for the light. We have not found that it works too successfully.

Along with the green light, green WALK signal system the mayor had his idea. Why not paint the entire area between the two white lines a solid bright green and create a tangible, visible island of safety for the pedestrian? Combined with the oft-used slogan "Walk On The Green", it would make the idea of traffic safety meaningful. It would tie the whole idea from the green light right down to the green crosswalk together. "Walk On The Green"—walk on the green light —walk on the green WALK signal —walk on the green painted crosswalk.

I felt it was at least worth an experiment.

We inquired locally and at the State Highway Department but discovered no such traffic paint was made. The standard colors in traffic paint are white and yellow. A green paint meant a special item. The longer we thought about the idea the better it became, so Mayor Hileman contacted the Traffic Paint Division of the O'Brien Corporation in South Bend, Indiana, to ask their opinion and help on our problem. They responded by telling us what we already knew—that no green traffic paint had ever been made.

We asked if an experimental batch, enough to cover the crosswalks at one intersection, could be

made up. O'Brien officials decided they would go along with us and produced 20 gallons of a dark green, rubberized traffic paint. It had the qualities of most of the traffic paints currently in use—it dried in five minutes, could be applied with either a roller or a brush, and lasted from three to six months depending upon the amount of traffic.

On March 16, 1954, we put down this batch at the intersection of 8th and Franklin Streets, the busiest corner of Michigan City. The reaction was spontaneous and slightly amazing. Over the first three-day period 98 percent of all the people using the four crosswalks walked only on the green WALK signal. Prior to this only about 60 to 75 percent had obeyed the light. Not one motorist stopped with his wheels or the nose of his car in the pedestrian area. Whenever a car overran the crosswalk the driver would immediately back off. As far as we could observe only three people were seen jaywalking in the blocks adjacent to the experimental intersection. Speed checks showed that motorists coming into this intersection slowed down perceptively when they could see the green safety zones. "Walk On The Green" had become an instant success.

Newspaper, radio and municipal interest also ran high. In the space of a few days the Michigan City News-Dispatch ran three different stories including four photographs. The First Federal Savings and Loan Association of Michigan City, completely to our surprise, published an unsolicited paid advertisement a quarter page in size in the local paper. It showed a picture of the mayor and myself along with our crew applying the paint and had this headline: "We Like the New Green Safety Lanes at 8th and Franklin". They went on to praise our work in making the idea a reality and the work of the O'Brien Corporation in developing the product. Mayor Hileman also received many phone calls from school and PTA officials as well as from municipal officials in nearby cities.

After observation of the idea in operation, we were not satisfied with the color and O'Brien wanted to try some additional experiments using reflectors in the paint for night driving. Another application was made May 16, both at the downtown intersection and on the crosswalks around the Central Elementary School, the largest school in Michigan City. This school application was made at the request of Mrs. Harvey Rhoda, president of the Michigan City PTA Council. This group felt that "Walk On The Green" would be of great benefit to the school children coming to and leaving school.

New Paint Better

Again the response to this new experiment was immediate. The new paint had a more bright, nearly luminous color. Flanked by the white striped lines, it could be seen a block away. It didn't darken from wear as quickly and it cleaned up after a rain storm or a simple brushing. The experiments with the beads in the paint proved unsuccessful and we abandoned this idea. The beads cut down the wear and also caused the paint to darken quickly. However, we were satisfied with the brighter paint for it did a job both in the daytime and at night. It was called "Sav-A-Child Green".

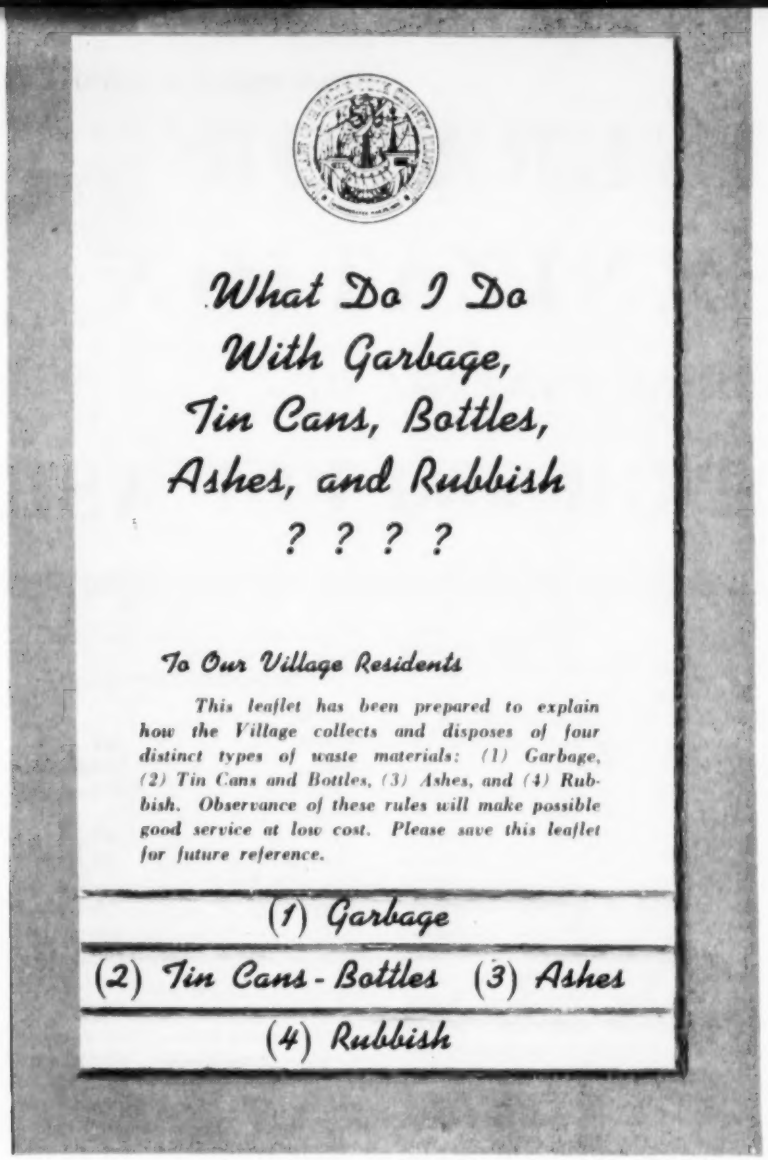
Satisfied now with the idea and with the product we tried them at various spots throughout Michigan City. The first place on our list was the resort area—Washington Park. All crosswalks at intersections, from one area to another in the park, and at entrances and exits were painted green. We also had 12" x 24" metal signs stamped out using the final color with the words "Walk On The Green". These telephone pole signs were installed at all crosswalks.

Meanwhile, the experiment at the Central School showed it could aid the safety of school children. I talked with Mrs. Rhoda and her comment was: "After sitting in my car day after day watching the students, my reaction is that this idea will save the lives of children —if not in Michigan City, then somewhere in the United States. We are thrilled with the results of the test and feel that every city and PTA should look into this project. It is a wonderful safety idea in protecting our children. The Michigan City PTA Council feels this is a very wonderful thing to have painted on every cross-street leading to schools. It has proven successful in our town."

At downtown intersections, in amusement areas and at school crossings, the "Walk On The Green" idea has been a tremendous success in Michigan City. In my experience no other safety project has gained as much attention or comment. This idea can be of value to children and grown people as well. After seeing this in operation, I know that "Walk On The Green" is the only way to establish crosswalks in a manner that will continue to protect the pedestrian.

● AUTHOR, left, and Mayor Hileman watch an application of green paint being made to crosswalk on downtown street.

● CROSSWALKS at schools are now safer. Motorists say that the green paint areas are visible half a block or more away.



THE Village of Glencoe, Ill., has issued information to its residents for the collection and disposal of four distinct types of waste materials: Garbage; tin cans and bottles; ashes; and rubbish. This information is in the form of a leaflet which, by text and cartoon-type illustrations, answers the question which is the title of this article. First it gives data on garbage: "*Garbage* is any combustible material (except leaves and branches) that can be placed in a garbage can, and includes kitchen waste. For safety reasons, garbage must be kept separate from tin cans and bottles.

The following material is also classed as garbage: Letters, facial tissues, floor sweepings and dirt from vacuum cleaners." These must be securely wrapped to prevent blowing over the neighborhood when the garbage can is dumped. Cardboard boxes and cartons are also considered under this category, provided they are placed in the garbage can and not stacked alongside."

Garbage should be wrapped securely in newspaper or put into paper sacks, with the surplus water drained off before wrapping. "Paper absorbs the moisture, helps keep the can from rusting and speeds incineration. The can should be galvanized and leak-proof and have handles and a tightfitting cover. Capacity should be no more than 20 gals."

The best place for keeping the garbage can is near the back door on the ground level. Collectors cannot go onto porches or inside of buildings.

Collections are made twice a week in residential areas and daily in the business section.

For a clean garbage can—wrap the garbage in paper, and then occasionally rinse the can with a solution of one ounce of laundry bleach to two gallons of water. (Flies and dogs do not like clean cans.)

Tin cans and bottles are to be placed "in a separate container (preferably another garbage can) next to the regular can, and this container should be covered at all times to keep out snow and water. Placing them in a separate container is a safety measure. It is frequently necessary for the men to reach into a can to loosen garbage, and when tin cans and bottles have been placed in the same container with garbage, the men have cut their hands in emptying the garbage cans. Both garbage and tin cans are picked up at the same time and disposed of in the same manner."

Ashes should be placed in a separate *metal* container approximately one bushel in capacity, with handles, located near the garbage can. "Only ashes should go into the can, and *no hot* ashes."

Ash collection is twice a week, usually on Tuesdays and Fridays, during the regular heating season. "Different crews handle this collection, so it may be different from garbage collection days."

No charge is made for collecting garbage or tin cans and bottles, as these services are paid for from tax funds. A charge of $18 per year, payable quarterly is made for collecting ashes and rubbish.

Rubbish includes "dry materials such as cardboard boxes and papers that are too bulky to put into garbage cans; wood boxes, metal junk; small shrubbery branches; and miscellaneous material; but does not include building materials." Paper is classed as rubbish, but the Salvation Army will collect this; it is suggested the Army be called and its phone number is given. Rubbish is collected once a week from the parkway just behind the curb, where the cans should be placed by 7 AM.

"Grass, leaves and lawn clippings should be burned (but not on any black-top or concrete pavement; burning injures the pavement and results in clogging gutters and sewers.)" However, the village will collect this material if it is placed in a suitable container weighing not more than 100 pounds when full.

In addition to all this information, this excellent folder says: "When you're leaving the Village for several weeks, notify the Police Department, and call City Hall and ask that your garbage service be discontinued during your absence. Please be sure to notify both departments when you return."

INCINERATOR MODERNIZATION

PROVIDES CONTROL OF

SMOKE, ODOR and FLY ASH

THOMAS W. HOPPER,

Engineering Manager

Day & Zimmermann, Inc.

MODERNIZATION of the Harrowgate Incinerator at G Street & Romona Avenue in the City of Philadelphia is the first step in a comprehensive program to provide modern incineration for city refuse and thereby eliminate the burning dumps which have been an eyesore and a nuisance to the residents for many years. When the program is completed, Philadelphia will have two remodeled plants and two new plants having an aggregate capacity of 2000 tons of refuse per day. Construction work for the two remodeled plants is now underway and design for the two new plants is well advanced. A fifth plant to have a capacity of 600 tons per day will be added in the future, after an appropriate site has been selected for it.

The Harrowgate incinerator, erected in 1923, is well situated in relation to population served, access streets, and utility services. The building structure and the layout of yard facilities were found, upon study, to be sufficiently well designed and in good enough condition to provide an adequate basis for rehabilitation to produce a substantially increased capacity. Moreover, such a rehabilitation program permits continued use of a garbage reduction facility erected at the site in 1934.

The incinerator plant originally included four Bartlett & Snow manually stoked, mutual assistance incinerators connected by flues to brick chimneys, each 169 ft. high, 10 ft. inside diameter at the top, located at opposite ends of the building. The plant was arranged on the side of a hill so that collection vehicles dump their contents over a 12 ft. wall to a large stoking floor where the materials were stored until charged into the incinerators. This process of dumping refuse on an open floor, with hand feeding and stoking of furnaces is inadequate in comparison with standards of cleanliness, efficient combustion, and low operating costs obtainable for municipal incinerators today.

The garbage reduction facility consisted of a three-story structure enclosing eight digester tanks, two receiving boxes, two hydraulic presses with pumps, and four liquor storage tanks with transfer pumps. A conveyor was provided to receive and convey the garbage to the digesters. Another conveyor received the tankage from the presses and conveyed it to the furnaces. The reduction operation removes oil and greases which can be sold and converts the garbage into a dry mass called tankage. This is readily burned in the incinerator furnaces. The reduction plant has a capacity for handling 64 tons of garbage per day. Steam for processing the garbage was obtained from a 215 hp boiler utilizing the waste heat gases from the incinerator.

Incinerator Design

After rehabilitation and the installation of new, modern equipment the incinerator will have a capacity of 300 tons per 24 hours of refuse augmented at various times with tankage. The garbage reduction part of the plant will have a capacity for processing 96 tons of raw garbage per day, based on one 8-hour shift. Equipment for performing the various operations will be installed within the existing building. After old equipment has

INCINERATOR DATA

Furnace		
Height	10	Ft.
Area	148.4	Sq. Ft.
Volume	1,484	Cu. Ft.
Grates		
Stationary	82.2	Sq. Ft.
Dumping	60.0	Sq. Ft.
Equivalent for Cone & Arms	6.3	Sq. Ft.
Total Area	148.5	Sq. Ft.
Combustion Chamber		
Height—Upper Section	13 Ft. 6 In.	
—Lower Section	12 Ft. 5 In.	
Area —Upper Section	132.73	Sq. Ft.
—Lower Section	103.87	Sq. Ft.
Volume	3,015	Cu. Ft.
Main Flue		
Width	8 Ft.	
Height	15 Ft.	
Area	120	Sq. Ft.

Furnace rating is based on handling 10 lb. of air per lb. of refuse incinerated.

Burning rate is 84.25 lb. of refuse per sq. ft. of grate area.

Velocity of Gases in Ft. Per Sec.	
Over Bridge Wall at 1800°F.	30
Through Combustion Chamber at 1600°F.	15
Combustion Chamber Exit Flue at 1600°F.	32.8
Main Flue Header at 1400°F.	14.8
Smoke and Fly Ash Eliminator at 600°F.	11.6
Chimneys at 600°F.	18.6

been removed, the building proper will be reconditioned throughout.

The yard arrangement and movement of trucks will be maintained essentially as at present. The scale house, which also serves as the Superintendent's office, will be modernized through replacement of toilet facilities, lockers, addition of new flooring, storerooms and windows. A new 30-ton truck scale will be installed at the scale house to weigh the trucks entering and leaving the plant. This scale will have a dial indicating mechanism and card recording system to enable the operator to stamp the weight, truck destination, the minute, the hour, and the date of weighing.

Trucks will turn, back up and dump contents into a new concrete refuse bin 31 ft. wide x 85 ft. long x 38 ft. deep, constructed in the existing building by removing a portion of an existing cellular foundation wall. The bin will have a capacity of 3400 cubic yards. It is equipped with scuppers and drains, and has a 12-ft. high timber topped concrete mid-partition fire stop, with access doors at each end. The bin is completely covered by the roof of the building, and a canopy will be constructed to give additional protection from the weather and to screen the dumping operation. Study showed that a travelling bridge crane could be installed over the new pit without raising the roof of the existing building. Since the plant is built on the side of a hill, there is no problem of clearance between the crane and the new incinerator equipment as these may be conveniently located at a lower level.

The design provides for one new travelling bridge crane, with a grab bucket, for transferring refuse from the pit to the charging hoppers of the incinerator furnaces. New crane rails were required and these were mounted on fabreeka plates in order to reduce vibration and sound transfer to the building structure in general. The crane has a span of 69′2″ which is longer than required for operation, but necessary to fit the existing building structure.

Incineration of refuse and tankage will take place in two Nichols Mono-Hearth furnaces, each having a burning capacity of 150 tons of material per 24 hours. Each incinerator consists of a cylindrical furnace with charging hopper, automatic stoker and forced draft fans, a separate cylindrical combustion chamber and inter-connecting flues. Incinerators discharge gas to a large common flue. The gases are conducted through the flue, water spray dust eliminators and induced draft fans, to existing chimneys at each end. Ash and non-combustibles resulting from the burning operation are discharged through dumping grates in each furnace to water sprayed ash hoppers with dumping gates directly underneath. The plant is so arranged that ash removal trucks can back directly under ash hopper gates for loading. Material discharged from the incinerators is of inert material composition highly desirable for land fill.

Design Criteria

Five main divisions of criteria were incorporated in the design of the Harrowgate Incinerator.

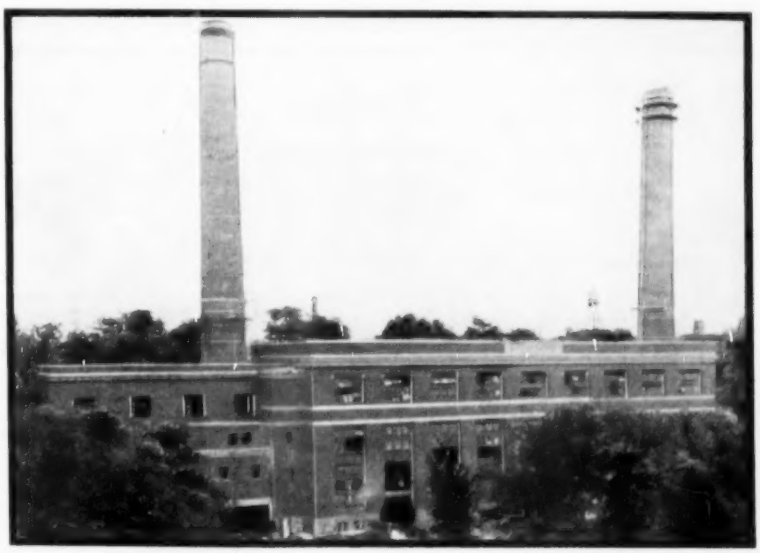
1. *High Temperature*: The plant is designed for an average temperature of 1600° F, with a maximum of 2000° F. The furnaces, combustion chambers and flues are lined with high temperature refractory materials and insulation to safeguard operation at these heat levels. The lining both absorbs and retains heat, returning it when temperatures drop.

2. *Proper Combustion Devices*: Each furnace is equipped with a Mono-Hearth stoker which is a mechanical device to eliminate hand stoking. It consists of a central cone having two arms set 180° apart, with a forward surface tilted at approximately 45°, rotating about a central point. As the arms pass through the furnace charge they turn the material over in the furnace so that all surfaces are exposed to the air and flames.

3. *Adequate Air Supply*: Motor driven forced draft fans blow air into each furnace under the grates to insure sufficient air for combustion at all times. Air is also blown into the bottom of each furnace through holes in the stoker cone and arms. A third supply of air is furnished through damper doors in the ash pit. Each combustion chamber is equipped with automatically controlled secondary air doors to permit air to be drawn into the chamber where it mixes with the products of combustion to complete the burning operation. These doors are responsive to combustion chamber temperatures. Induced draft fans and large chimneys function to create the draft which carries away the products of combustion.

4. *Volume of Chambers*: The design specifies combustion chambers of large volume in order that burning of gases, and particles carried in the gases, may be satisfactorily completed. The flues connecting the combustion chambers to the chimneys are of large size so that gases will travel at low velocity, thus allowing ample time and space for complete burning and for large particles of fly ash to settle out.

5. *Mixing Air with Products of Combustion*: Thorough mixing of air with the products of combustion is accomplished by turns and changes of direction in the gas travel to break up any stratification that may tend to develop. There is a distance



● **AFTER modernization the Harrowgate incinerator will have a capacity of 300 tons of refuse per 24 hours.**

of approximately 152 lineal feet, as measured on the centerline of ducts and chambers, between the grates and stacks, and a total of six 90° turns.

Preventing Air Pollution

A problem of increasing importance encountered in the operation of incinerator plants in heavily populated areas is the discharge of fly ash, smoke, and odors to the surrounding atmosphere. This is by no means as noticeable visually or physically as the unsightly and objectionable burning dumps, but it is of enough importance that specific provision be made to reduce the discharge of air pollutants to a minimum.

Careful study of the problem was conducted during the preliminary stages of design. It was stipulated that processing equipment, controls, facilities, stacks and other structures should be so designed and coordinated as to insure operations well within the City of Philadelphia Ordinance for the Control and Regulation of Air Pollution. This ordinance is comparable with the Code of the American Society of Mechanical Engineers on Air Pollution and specifies, along with various other requirements, the elimination of noxious gases, a maximum dust loading in stack gases of 0.85 lb. of solids per 1,000 lb. of gas corrected to 12% CO_2, and a color not more pronounced than No. 2 Ringelman Chart.

An investigation of incinerator plants in other cities disclosed that little had been done toward the correction of air pollution. An exception was found in Los Angeles County, California, where certain municipalities, sensitive to atmospheric conditions prevalent in that area, had taken positive steps to reduce the discharge of particulate matter to the atmosphere.

The practice in the Los Angeles area plants favored the installation of water spray scrubbing chambers, and after a review of other types of dust collectors, it was decided to adopt this method with certain modifications in the design of the Harrowgate incinerator plant.

Extra facilities provided to avoid air pollution may be summarized as follows:

1. Odor Elimination: Odors from the burning of garbage and refuse are directly traceable to certain unburned hydro-carbon compounds escaping with the products of combustion. In a well designed incinerator, incorporating the design criteria mentioned previously, the quantity of such odors would be practically negligible. In a poorly designed incinerator they would be greater and might constitute a nuisance.

The Harrowgate plant is directly adjacent to a residential area, and hence the need for elimination of all odors becomes of prime importance. The basic design of this plant should eliminate the possibility of objectionable odors escaping to the atmosphere. However, to provide an additional safeguard against such possibility the decision was made to support operating temperatures in the combustion chambers at a minimum of 1200° F. The hydrocarbon compounds, which are the source of odors, break down and burn out completely at this temperature or above, but might pass through the chambers and flues should the temperature drop below that level.

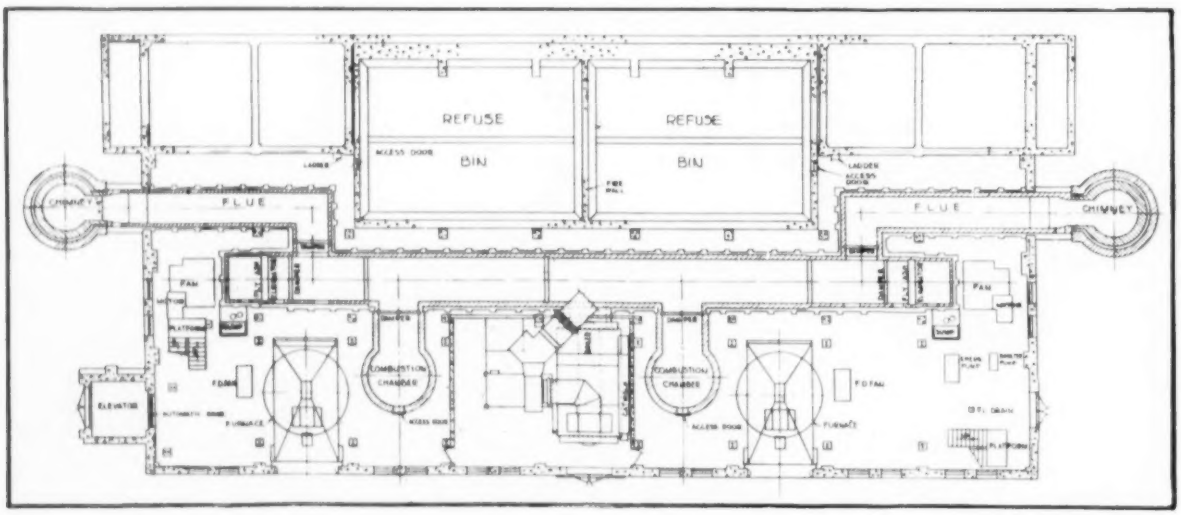
Two facilities were provided to insure maintenance of the correct temperatures:

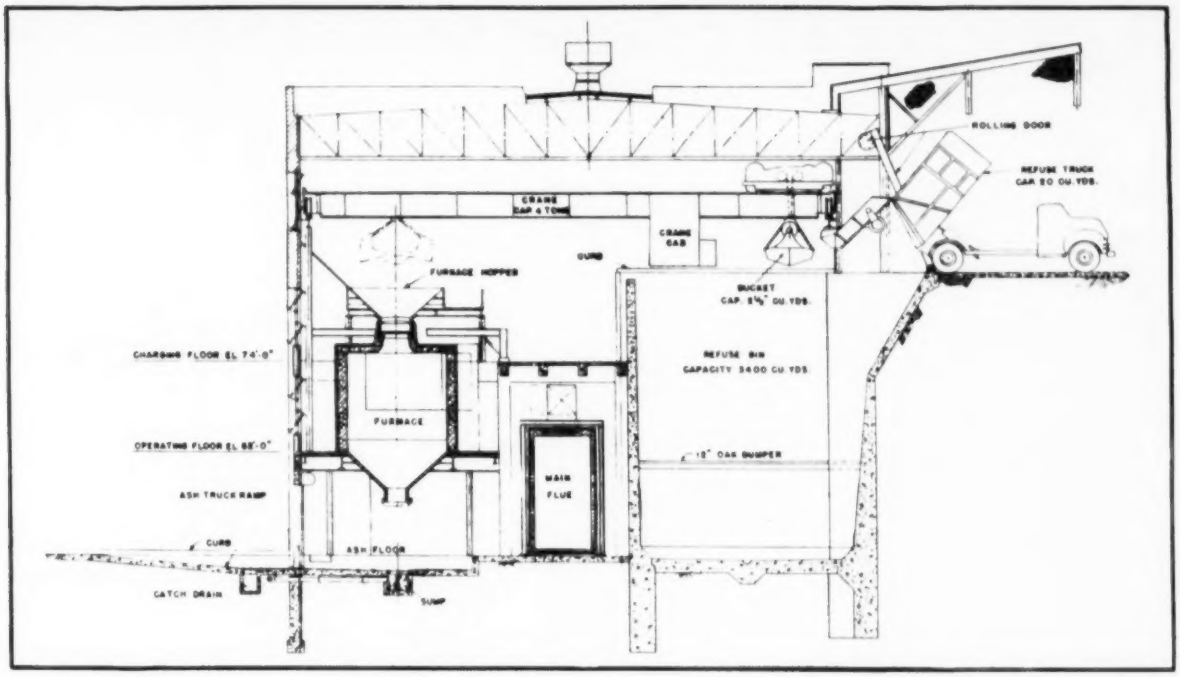
a. Automatic control of secondary air dampers: These dampers are installed to provide secondary air to the combustion chambers for complete combustion. They also furnish excess air to keep the temperature of the equipment within safe operating limits, normally a maximum of 2000°F, through the dilution effect of mixing hot gases with cold air. In the usual design these dampers are manually operated, and it is the duty of the operator to open them full width as the temperature increases to 2000°F, and to close them as the temperature drops to 1200°F. With this arrangement, the operator sometimes neglects to close the damper. When this happens the gases cool below 1200°F. during certain periods of the process cycle, and odors from the burning operation may then escape to the atmosphere.

In the Harrowgate installation these dampers are automatically controlled from a pyrometer located in the combustion chamber so that dampers will be wide open at the high temperature level and completely closed if the temperature drops to 1200°F.

b. Supplementary Oil Burners: The operation of an incinerator furnace differs from that of a boiler or a metallurgical furnace in respect

● **AUTOMATIC CONTROLS to eliminate nuisances are provided by dampers, supplementary burners and fly ash eliminators.**





● **SECTIONAL VIEW** shows new arrangement for mechanized refuse handling. Crane was installed without raising the roof.

to the consistency of fuel consumed. Instead of a constant grade commercial fuel such as coal, oil or gas, the incinerator must burn a complex mixture of paper, rubbish, tin cans and glassware. The content of the charge to an incinerator varies from hour to hour and from day to day, making it difficult to regulate and control the burning operation. Incinerators designed for batch processing with automatic stoking have proven highly successful for this service in that operators may quickly adjust air supply and rate of feed to meet particular conditions and material encountered. Even with good operation, however, there are short periods when some piece of material may have to be removed from the grates. At such times the doors will be opened and the temperature might drop below 1200°F.

To provide insurance against these occurrences, oil burners were installed. These burners are placed in operation if and when the temperature drops to a predetermined level. This is a specific provision to eliminate the possibility of odors passing through with the gases, not required for normal operation of the incinerator plant and probably used only on rare occasions.

2. Dust Elimination: Two provisions are included in the design to reduce fly ash carryover and smoke emission from the plant chimneys.

a. The design provides extra large flues and chambers for insuring low velocity of gas movement, which allows particles to settle out.

b. A dust eliminator is installed in the main flue ahead of each of the two chimneys. Each eliminator has three rows of water sprays, each row containing five nozzles on the sides and top portion of the chamber. The water sprays simulate the action of a rain storm in wetting and knocking down small particles of fly ash contained in the gaseous products of combustion. The bottom of the chamber is in the form of a pond, on which the gas stream is directed. The dirty water is drained off to a settling chamber and then to the storm sewer. Approximately 360,000 gallons of water per day will be used for this purpose.

The discharge end of the dust eliminator is provided with louvre baffles which present a staggered impingement surface to the gas travel and reduce moisture entrainment carryover. The water sprays lower the gas temperature to approximately 600° F and it is necessary to install an induced draft fan to draw the products of combustion through this additional resistance.

3. Instruments: Each incinerator is provided with an indicating recording pyrometer on each combustion chamber. Pyrometers are of the radamatic recording type, with indicators located on the operating floor and the recorders in the Supervisor's office. The instruments have a low temperature alarm set at 1200°F. These pyrometers are in addition to those controlling the secondary air dampers. Each stack is equipped with a smoke indicator and recorder to permit the operator to know at all times the condition or color of the stack discharge. A wind direction instrument is also provided.

Conclusion.—The modernization of the Harrowgate Incinerator Plant is an important step toward solving the problem of refuse disposal in the City of Philadelphia. The basic planning for this facility incorporates an efficient layout, the installation of modern equipment and the application of safeguards to eliminate air pollution from dust and odors.

The author wishes to acknowledge the assistance and fine cooperation of the officials of the City of Philadelphia, especially Messrs. Henry D. Harral, Commissioner, Department of Streets; John A. Bailey, Deputy Commissioner, Department of Streets; A. Michaels, Chief of Refuse Disposal Operations, and George W. Kelley, Jr., Special Consultant on Incinerator Operations.

Automatic pH Control Saves Chemicals

PETER L. SHUGART

WHEN the pH of water is too low, iron water mains oxidize. Increased velocity of water through the pipes may cause these iron oxides to break loose, giving the water a rusty or red color, commonly called "red water." The Macon (Ga.) Water Works, which processes 15 to 16 million gallons of water per 24-hour day, faced the problem of eliminating this disagreeably colored water in order to assure an attractive product for its consumers.

Previously, mechanical feeders were employed for the addition of dry alum and lime. Alum is added to the water to improve sedimentation; its use results in a decrease in pH. Lime is then added to raise the pH and thus prevent formation of red water. When too little alum is added, coagulation is imperfect and the finished water tends to be cloudy. When too little lime is added, red water results. With the employment of mechanical feeders, pH was checked every two hours and the feeders were set according to the most recent pH measurements. Due to lags and varying demand, this procedure resulted in wasted chemical and only partially effective control.

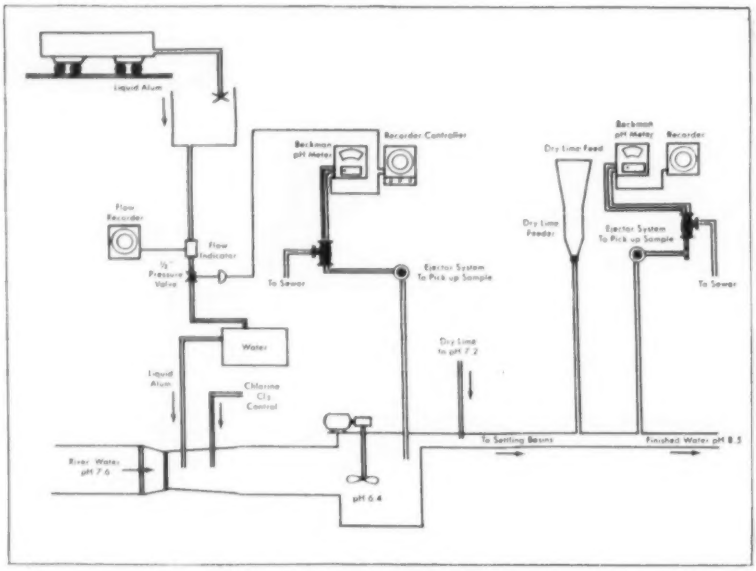
Beckman Automatic pH meters with recorders and controllers were installed at the Macon Water Works for better chemical control. The pH meters and recorders are mounted on a panel in the chemical room. Electrode sets are supplied with continuous samples drawn from control points after the introduction of alum and lime. Automatic addition of liquid alum and chlorine depresses the raw water pH of 7.6 to a control range of 6.4 to 6.6 and maintains the value to within 0.1 pH unit during the coagulation process.

After passing through settling basins where the floc precipitates, the water is further treated with lime by a Beckman pH controlled system to bring the pH to 8.5. Water in this slightly alkaline condition is relatively non-corrosive to iron mains. Thus, it is delivered clear, colorless and uniform in quality to the user.

Estimated savings in alum alone have amounted to $1500 per year. Alum and chlorine consumption were each cut 50 percent. Turbidity of the water supplied to the filter has been reduced from the range of 8-12 ppm to 1-2 ppm, permitting substantial savings in wash water.

Solution of the red water problem by automatic control has eliminated the waste of 100,000 gallons of "blow off" water per day. Prior to automatic control, it was the practice to draw off water from the fire hydrants regularly. This process required one man almost full time. The water loss was particularly serious in the summer months, when water was in shortest supply.

In addition to more satisfactory water for domestic use, there are no longer any complaints from industrial users regarding red water—particularly significant in the case of the local textile industry, which requires large quantities of pure water.



● **SIMPLIFIED flow diagram through Macon water works showing how automatic controls are used to maintain a pH of 8.5 in the water leaving the plant.**

Master Traffic Control

(*Continued from page 77*)

Based upon the density of traffic, the automatic cycle and off-set selection will provide progressive traffic flow between off-peak traffic periods at speeds of 18 to 22 miles per hour in the central business district and at speeds of 18 to 30 miles per hour on streets leading into the area. Cycle lengths during off-peak traffic periods will vary from 40 to 50 seconds and the offsets between adjacent intersections will equal one-fourth cycle.

During periods of peak traffic flow, simultaneous signal timing will be used in the area bounded by Crawford, Gray, Bagby and Franklin Sts. The cycle length will vary between 70 and 90 seconds depending on the traffic density. Traffic approaching or leaving the area of simultaneous signal operation will move with progressive signal timing. The simultaneous signal timing is employed during the periods of peak traffic movements for, as the blocks become filled with vehicles being unloaded from parking lots and garages, all traffic on a street must move simultaneously or none can move. Under such conditions of traffic, any attempt to develop progressive traffic movement will reduce the capacity of the streets because of the intersection blocking and frequent stopping which will develop as large numbers of vehicles enter the streets and as turning movements introduce obstructions to progressive traffic flow.

TEST on Corrosion Inhibitors in Snow and Ice Control

SAMUEL SISLER,

Testing Engineer, County Engineers Office, Cuyahoga County, Ohio

CONTROL of ice and snow on the highways and bridges of the Cleveland-Cuyahoga County, Ohio, district along Lake Erie is a major problem. Like many other communities in the Great Lakes snow belt, this county spreads salt on the roads to keep them open.

Salt, while it does a thorough job of removing snow and ice, has a characteristic that makes it subject to criticism from the standpoint of automobile and steel bridge maintenance. Salt mixed with ice forms a brine that accelerates rusting of automobile fenders and underbodies and can likewise attack steel in bridges and other highway structures.

In a typical winter, the Cuyahoga County highway system uses about 5000 tons of salt for ice control. The salt is used with or without cinders, depending upon conditions. The entire county, including the City of Cleveland and all other municipalities within the county limits, uses approximately 20,000 tons of salt annually.

In 1949, with an eye to the interests of both motorists and bridge maintenance, County Engineer Albert S. Porter assigned to the laboratory the job of studying the salt corrosion problem to see what could be done about it. We started with a series of standard laboratory corrosion tests involving salt solutions of 5 and 10 percent concentrations. To these salt solutions we added non-toxic polyphosphate type rust inhibitors of the kind recommended for mixing with the salt being spread on the streets, and exposed test panels of mild steel to these solutions.

These chemical corrosion inhibitors form a microscopically thin protective film over steel, effectively insulating it from the corrosive effects of water, salt brine and the atmosphere. In our laboratory tests they produced the following results: On the average, an approximate 50 percent reduction in the overall corrosion rate was obtained by adding one pound of the inhibitor to 100 pounds of salt in a 5 percent solution. In the 10 percent salt concentration, use of the inhibitor in the same proportions reduced corrosion by as much as 90 percent, cutting the corrosion rate in the salt brine below that of even plain water.

It should be noted that corrosion authorities generally are agreed that even if it were possible to eliminate salt entirely, corrosion of steel and automobiles would continue but at a reduced rate. Although conclusive data based on actual corrosion of vehicles are lacking, the indications are that the use of salt on trafficways may approximately double the amount of corrosion. Our own laboratory tests indicated that increased corrosion due to salt brine would be of that magnitude, and that treatment of the salt with one percent inhibitor could be expected to neutralize the added corrosiveness of the salt.

Testing in the Field

Armed with these laboratory findings, we took the salt corrosion project out of the laboratory and into the field. We wanted to find out how the rust inhibitor would function under actual highway conditions.

We selected two isolated areas for our field corrosion tests. For one of these areas we mixed rust inhibitor with the salt, in proportions of one pound of inhibitor to 100 pounds of salt. For the other area, we used no inhibitor with the salt.

Our method of mixing the inhibitor with the salt may be of interest to others. We store bulk salt under roof in bins at our yards. The salt is stock piled by means of portable belt conveyors.

The blending-in of the inhibitor was accomplished by throwing shovelsful of known weight of inhibitor on the salt conveyor, timed in such a manner as to produce a one percent mixture.

This relatively simple and inexpensive method of mixing the inhibitor with the salt proved to be entirely adequate for the job, especially since further mixing or blending took place when the salt trucks were loaded and again by the action of traffic over the salted roads.

Cuyahoga County maintains several major bridges, three of them carrying traffic across the Cuyahoga valley into downtown Cleveland. The three downtown bridges are serviced by de-icing crews who work out of the county garage at the western end of the Detroit-Superior high level bridge. This bridge is located between the Main Avenue Bridge to the north, adjacent to Lake Erie, and the Lorain-Carnegie Bridge to the south. A recent traffic count showed that approximately 200,000 vehicles cross these bridges from 7 am to 7 pm daily.

The three bridges constituted our "inhibited area".

● **CARNEGIE Ave. bridge, one of the "inhibited areas" of the test program.**

The non-inhibited area, in which no rust inhibitor was used with the salt took in a portion of the southeast section of the county comprising residential and light manufacturing districts. This area is serviced from the county garage at Miles and Warrensville Center Roads. To determine more exactly how much corrosion resistance was provided by the rust inhibitor, four weighed test panels cut from autobody steel were mounted, two on the left and two on the right sides of the front bumpers of six county salt and cinder trucks serving the roads and bridges in the selected areas.

Some communities have made tests with panels mounted under passenger car fenders. In trying different mounting locations preliminary to the start of the present test, we found that when panels were mounted under truck fenders, they were too easily lost or damaged. Consequently, we hit upon the "outside" mounting. In this position, they were freely exposed to the weather as well as the splash of brine and slush from passing vehicles. None of our panels was lost or suffered mechanical damage.

Three trucks were assigned exclusively to service each area, inhibited and non-inhibited, making it possible to maintain a direct check on the trucks that were traveling through protected territories and those that were traversing salted but not inhibited streets.

The panels were mounted on the trucks early in January 1953 and remained until April 1. Weather conditions required that the regularly assigned trucks service their respective areas on 14 days of the approximate 3 month period.

Annual snowfall in this part of Ohio averages 41 inches, varying through the years from 10 to 80 inches. From January to April, the mean temperature is below freezing (25° to 29°F). On the average, temperatures do not rise above freezing on 45 days of the year. Average relative humidity during the winter months is approximately 75 percent, ranging from about 70 to 80. The yearly average ranges from 59 to 80 percent.

Results of Tests

At the end of the three months period, the 3 x 3-inch steel test panels were removed and cleaned to determine corrosion weight loss. Test panels mounted on trucks assigned to operate in those areas in which the inhibitor was added to the rock salt showed an average of 40 percent less corrosion than those mounted on the trucks operating in the non-inhibited salt area.

The results of these field corrosion tests under highway conditions showed approximately the same degree of corrosion inhibition observed in laboratory tests with the same inhibitor in a weak (5 percent) salt brine, such as that formed by melting ice in the presence of salt.

Table 1—Field Test Results

De-icing Treatment	Rate of corrosion mg/dm²/day Range	Average
Salt without inhibitor	8.0—14.4	10.2
Salt plus inhibitor	5.0— 7.1	6.1

Although it is acknowledged that many variable factors influence corrosion, we feel that our tests were made under conditions representative of those encountered every winter in the Cleveland district. The results indicate that a major portion, if not all, of the corrosion directly attributable to de-icing salt can be neutralized by the use of suitable commercial inhibitors.

It will be noted, of course, that our tests to date have been concerned with bare metal, and it is admittedly true that brine solutions will not have the same relative effect on metal surfaces which have been thoroughly coated with asphaltic or other paints (such as undercoating on autos or bridge painting). However, the paint protection frequently becomes lost for various reasons and bare metal is exposed leaving it susceptible to brine attack.

In the final analysis, the use of inhibitors is a policy matter in which case the cost of providing the service must be weighed against the beneficial results obtained.

We have not reached definite and final conclusions and are not prepared at this time to embark on a program which would involve the use of inhibitors as standard practice in all salt applications. We are, however, encouraged by the results of our tests to date and believe that the use of corrosion inhibitors with salt applications may be very helpful in areas where metallic corrosion is a serious problem and where the beneficial results justify the expenditure involved.

Our field tests will be continued next season and probably will be extended to cover bridge structures. However, our research program is broader in scope than just protecting our bridges and equipment. Our basic interest, of course, is in providing better service to the citizens of Cuyahoga County and this extends to minimizing vehicle corrosion as well.

● **THESE bridges, High Level Bridge in the foreground, and Main Avenue Bridge in right background were the other "inhibited areas" in the test.**

Stretching Your Maintenance Dollars on Low Cost Pavement

W. E. KENNEDY,
Director of Public Works
W. E. PEEBLES,
Asst. Director of Public Works
City of Inglewood, California

● **PAVEMENT BURNER and scarifier in operation. This step prepares the existing pavement for resurfacing by leveling surface imperfections and improving the bond.**

A NEW type, low cost pavement resurfacing, with many interesting features, has been constructed by the city of Inglewood, Calif.

It is important to recognize that this method of resurfacing is structurally only as sound as the base of the existing pavement. Should there be localized base failures on any given street, these failures will have to be removed and the base condition corrected. Ravelling, cracking, disintegration or surface failures can be neglected as this method provides for this type of failure correction at the time of application.

The street or highway should be free of weeds, such as exists in the cracks of many city streets and along the gutter lines. The weeds are removed, either by hand or blade a few days prior to resurfacing and a weed killer applied. The edge of pavement is usually bladed ½ inch deep to obtain a better bond next to the concrete gutter. This operation is optional depending on the original type of pavement and its condition at the gutter line. A three to four-man crew can complete one average block with an excessive weed condition in a day. Usually, we find the preparation operation can be accomplished at the rate of three blocks per day.

Resurfacing is accomplished in four continuous operations, depending on traffic conditions, at the rate of 60,000 to 80,000 square feet per day. The first operation consists of burning the street with a pavement burner at approximately 2200° F, with a modified pavement scarifier pulled behind the burner. The burner softens the existing pavement and the drag scarifies and gives a leveling effect at the same time. The drag, approximately 9 feet wide, consists of a series of bars with 20 penny spikes placed 2 ins. center to center. The type of existing pavement determines the depth of penetration of the spikes; however, it has been found, that in nearly all cases, penetration is ½ inch. It should be remembered that complete scarifying of the existing pavement will not be possible as some low spots will be missed. It is our belief that the burning operation revitalizes the existing pavement oil; and while the scarifying provides an excellent bond, the same bond is obtained at these low spots.

Following the burner-scarifier, while the existing pavement is still warm, a tack coat of SS-2 (Asphalt Institute Specifications) is applied at the rate of 0.10 gallon per square yard. Immediately following this operation is the pavement layer, a Barber-Greene, adjusted to give approximately 10 pounds per square foot or 1-inch thickness. At the proper rolling temperature, the

● **RESURFACING team moves along, with the tack coat distributor closely followed by the Barber-Greene paver. Work on one block is completed in an average day.**

● EFFECT of the scarifier may be seen in this close-up of the machine that does the work. Spikes penetrate the softened pavement to depth of about ½ inch.

pavement is rolled and the project completed.

The present pavement specifications call for a ¾-inch maximum aggregate with 5 percent to 7 percent of the following: 80-100, 150-200 paving asphalt or SC-6 oil. The latter is being used on secondary streets and the former on major city streets or streets with high traffic volume where greater wear will occur.

Specifications for the aggregate grading are as follows:

Size	% Passing
3/4"	100
½	95-100
#4	50-60
#8	40-50
#30	25-35
#100	12-20
#200 wash	6-10

This paving operation has many advantages, among them being low cost; ease of preparation in that an average block can be completed, after weed control, in one day with the street open for traffic that evening; excellent bond to existing street; and the dense mix which gives an excellent water repellent surface.

The paving, which includes burning, scarifying and pavement material in place, is let by a yearly contract on a square foot basis at a cost to the City of Inglewood, California of 4½ cents per square foot. Our forces raise the manholes after the project is completed.

"PARKY" is a New Symbol of Cleanliness for Public Grounds

The City of Los Angeles Department of Recreation and Parks recently conducted a city-wide contest to create a character like Smoky The Bear to symbolize good housekeeping away from home. "Parky", the pert kangaroo, was the winner.

The Los Angeles County Board of Supervisors and the Los Angeles County Parks and Recreation Department have adopted "Parky" and the slogan for their clean-up program through permission granted by the City of Los Angeles Department of Recreation and Parks.

Other California cities and counties are requesting and receiving permission from the City of Los Angeles Department of Recreation and Parks for the use of "Parky" and the slogan.

The City of Los Angeles Board of Public Works authorized their Street Maintenance Division to place large "Parky" decals on all aluminum street corner trash receptacles and also on those used by the neatly white-garbed hand street cleaners in picking up trash thrown by the public on the public on the streets.

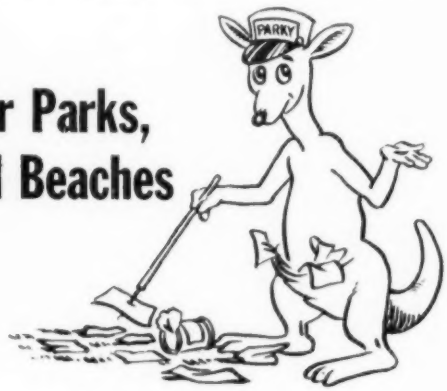
The City of Los Angeles Department of Recreation and Parks has 109 playgrounds and recreation centers, 110 parks totaling nearly 10,000 acres, 30 swimming pools, 11 miles of ocean front beaches, 2 local and 3 mountain vacation camps, 8 golf courses, nationally known Travel Town, and many other recreation and cultural facilities. Over 6000 bright yellow trash receptacles, with "Parky" and the slogan are at all these facilities for use by the public.

"Parky" and the slogan "Help Keep Your Parks, Roadsides and Beaches Clean" is a necessary year-around City of Los Angeles program to help the public realize "it pays to be clean". 55,000,000 patrons using the recreation and park facilities annually means that the unsightly mess left by litterbugs is diverting a goodly sum of money away from much needed further beautification of existing facilities and the additional maintenance needs not now being taken care of created by such a large annual patronage.

Editor's note: One of the resolutions adopted by the membership of the American Public Works Association at their recent Congress at Atlantic City called for the endorsement of the character "Parky" and for a slogan for the use of its members in the furtherance and promotion of year-round clean-up programs.

PARKY SAYS:

"Help Keep Your Parks, Roadsides, and Beaches Clean."



APWA News

AMERICAN PUBLIC WORKS ASSOCIATION
1313 EAST 60th STREET, CHICAGO 37, ILLINOIS

Standard Forms for Construction Contracts Ready

Copies to be Distributed to Members

The membership of the American Public Works Association at its 60th annual meeting in Atlantic City, N. J., approved a resolution recommending that the Uniform Public Works Engineering Construction Forms prepared by a joint committee of the APWA and the Associated General Contractors of America be used whenever possible in awarding contracts for public works construction projects. Copies of these forms are being sent without charge to all members of the AGC and to those members of the APWA that are concerned with the preparation of contract documents. Nonmembers of these organizations may obtain copies of the forms for a nominal charge from the Associated General Contractors of America, Inc., 1227 Munsey Building, Washington 4, D. C.

Documents Include Invitation, Proposal, Agreement

George Thompson, former City Engineer of Detroit, Michigan, and C. R. Ralph, General Contractor of Topeka, Kansas, served as Co-Chairmen of the Joint Committee which prepared these forms. The complete document includes an invitation for bids form, instructions to bidders, a proposal form, a contract (agreement) form, and a set of general contract conditions.

The widespread use of these forms, modified when necessary to conform to local requirements, is expected to minimize costly delays, encourage a greater degree of competition for public works contracts and in general improve municipal-contractor relations.

Utah Chapter Elects Officers

A new slate of officers was elected to guide the development of the Utah Chapter during the next year, at a meeting held in Salt Lake City. L. W. Myers, Assistant City Engineer of Salt Lake City, was named President to succeed Roscoe Boden, County Engineer, who will continue to serve as an ex-officio member of the Board of Directors. Lynn M. Thatcher, State Sanitary Engineer, was elected First Vice-President, and Earl Conder, City Engineer of Provo was elected Second Vice-President. Tom McCoy, Executive Director of the Utah Municipal League, was re-elected Secretary-Treasurer of the Chapter. Other members of the Board of Directors are: E. J. Allison, City Manager, Ogden; J. W. Allen, Manager of Distribution, Mountain Fuel Supply Co., Salt Lake City, and George W. Poulsen, Jr., Consulting Engineer, also of Salt Lake City.

Iowa Chapter Holds Annual Meeting At Waterloo

Over 50 members and guests enjoyed a full day's program arranged by the officers of the Iowa Chapter at a meeting held in Waterloo. Martin Gerber, State Sanitarian of Des Moines presented an interesting film and lead a discussion on sanitary landfill operations. W. O. Fuller of the Des Moines Department of Health gave a talk entitled—"Methods of Construction of Septic Tanks and Procedures for Making Percolation Tests." "Maintenance and Patching of Streets" was discussed by W. L. Hinderman of the Minneapolis Office of the Asphalt Institute, and C. W. Hamblin, Supt. of Public Works of Mason City lead an open forum discussion of public works problems. Professor L. O. Stewart, Head of the Department of Civil Engineering, Iowa State College at Ames,

(*Continued on page* 102)

Northern California Chapter Elects New Officers

New Officers of the Northern California Chapter, American Public Works Association: Left to right—John A. Morin, vice-president, City Engineer of Oakland; Richard F. Lovejoy, President, Director of Public Works, San Leandro; John L. Kergel, Secretary-Treasurer, Right of Way Clearance Agent, State Division of Highways; and Olof E. Anderson, Program Chairman, Alameda County Chief Deputy Surveyor.

Montgomery Named Prexy of Ohio Chapter

Former Ohio River Valley Chapter Meets at Columbus

T. J. Montgomery, City Engineer of Cincinnati, was elected President of the newly constituted Ohio Chapter (formerly Ohio River Valley Chapter) of the APWA, at its annual meeting which was held in Columbus. C. A. Boeke, Director of Public Service, Middletown, was named Vice-President; Leo Flotron, Chief Highway Engineer, Dayton, was re-elected Secretary- Treasurer; Robert Werner, Chief Engineer, Columbus, R. J. Fiemeyer, Director of Public Works, Hamilton, and R. J. Finn, President of the Bode-Finn Company, Cincinnati, were elected to the Board of Directors.

The Chapter meeting was held in conjunction with the Ohio Municipal Conference which was sponsored by the Ohio Municipal League. Over 50 members and guests were in attendance at the meeting. Donald Gehring, Assistant Director, Wire Reinforcement Institute of Washington, D. C. showed slides and gave an interesting talk on the use of wire reinforcement with bituminous materials in resurfacing streets. Mr. Montgomery presented an excellent paper entitled "Factors to Consider in Constructing Residential Streets". Other subjects discussed at the Chapter meeting were—"Snow and Ice Control on Municipal Streets" by John Alspoch, Director of Public Service, Toledo, and "Maintenance of Municipal Vehicles" by Raymond Rouse, Supervisor of Equipment, Waste Collection Division, Cincinnati, Ohio.

Iowa Chapter Meets

(*Continued from page* 101)

was the featured speaker at the dinner meeting.

Action taken at the business meeting resulted in the election of Carl D. Smith, Assistant Health Officer of Cedar Rapids to the Presidency of the Chapter to succeed Cletus Allen, Supt. of Streets, Dubuque, who will continue to serve as an ex-officio member of the Board of Directors. Kenneth J. Cullen, City Engineer of Dubuque, was named Vice-President. Eli N. Eastman, Supt. of Sewers, Waterloo, was elected Secretary-Treasurer and Paul V. Roberts, Supt. of Public Works of Sioux City was elected to serve as a member-at-large of the Board of Directors.

STANDARD SPECIFICATIONS

Subgrades and Foundations for Pavements

A revised edition of a series of Standard Specifications for the construction of subgrades and foundations for pavements has just been released by the Association. The 34-page booklet consists of 5 parts covering earth subgrade, pavement foundation of water bound macadam base course, bituminous macadam base course, hot-mix hot-laid asphaltic concrete base course, and Portland Cement concrete base course. These specifications, prepared by an APWA Committee headed by Leo Flotron, Chief Highway Engineer, Dayton, Ohio, supersedes the series of specifications for this type of construction which were originally prepared and published by the Association in 1936. This publication is available from the American Public Works Association, 1313 E. 60th Street, Chicago 37, Illinois, and is priced at $2.00 per copy to non-members and $1.00 per copy to members if payment accompanies order.

WORK SAFETY PROGRAMS

Frank Randall,
Secretary, So. Calif. Chapter

SAFETY is always cheaper than accidents. There is no operation that can pay off so well and at the same time provide the personally satisfying reward as in saving a worker's life or limb. This was the gist of the panel discussion on Work Safety Programs at the Atlantic City convention.

Of course a supervisor and his boss have to want safety to make it work. They have to believe that "no job is so urgent, no service is so important that we can't take time to do it safely." Perhaps until a supervisor has to go to a man's wife and kids and tell them that daddy will not be home tonight because daddy is in the hospital or in the morgue, that supervisor will not believe. Perhaps some bosses will never believe because they will not admit that when a worker is hurt or killed the boss has lost control of the job. It is not the worker's fault until he has been told how to do the job and given the proper tools and proper conditions to do it.

But let's take a money-wise look at safety, the banker's view. How much money can we save by being safe? At least one city representative on the Safety Panel said his city council holds that a city cannot legally spend public funds on safety measures. Perhaps this is the place where we can get six or seven new cars free; let's see how some cities and industries have done just this.

The direct cost of an accident may be considered the cost of carrying the injured off the job and the cost of medical treatment. The indirect costs which range upwards from five times the direct cost, arise from loss of time by other workers, investigations, loss of spirit and upset.

How about another man to carry out the assignment? The chances are, if you have eight or ten lost time accidents a year you have two or three extra men on the payroll that you don't need just to take care of lost time accidents. What does it cost you to put a man or woman on the payroll? Don't kiss off hiring costs at a mere $100, but get your sights up to $500-$1000 per person hired, depending on volume. Analyze your hiring costs, that is your first investment in a man. An employee on the job and trained for say five years approaches a sizable investment in dollars and a lost time accident lays up that expensive tool.

If the Bell System had not started its safety program in 1924, four hundred men would now be dead. Four hundred death benefits would have been paid to families who would now be without a father. That's a sizable chunk of money.

Or take the field foreman who lost his foot, and though he hated office work he is now a clerk. What are his chances of promotion in competition with whole men? What has the organization lost in a man who otherwise would have been a highly valued employee?

If a certain organization had not supplied its employees with safety glasses, in 1953 alone 110 men would have had eye injuries all of which would have required medical attention, and a great many of the injuries would have resulted in lost time accidents. That organization says and means that a foreman who is not safety minded will not reach a higher position regardless of any and all his other qualifications for promotion.

If I were a wife, especially if we had children, I would like my husband to work in a job where his boss had control of the job and that means that safety is a feature item. Who will underestimate the woman's factor in attracting good men to stay on your jobs?

There is a city of 600 employees that paid a workman's compensation insurance premium of $33,000 in 1950. After establishing a safety program the 1953 premium, based on the record, was $15,000.

Another city with 3500 employees cut its annual compensation rate from $195,000 in 1950 to $110,000 in 1953.

The Oil Well Service Co. picked up a check for over $11,000 on September 8, 1954, representing a 51% refund of insurance premium because it conducted its operations with maximum safety to its employees.

The Sunkist Growers in Southern California picked up a check on September 15, 1954, for $522,352.21 representing a 44½% dividend on their compensation insurance premium, and it is expected to raise the refund to 47% of the premium by the end of 1954.

There's gold in them hills. Satisfying, too.

Incidentally, safety is the subject of the November 2 meeting of the Southern California Chapter.

Areas in transition *from residential to industrial . . .*

Large-diameter Clay Pipe is solving the sewage problems of this Detroit neighborhood, which is rapidly developing into an industrial center. The project was financed by the McLouth Steel Corp. and designed by the Engineering Department of the City of Detroit. City Engineer George Thompson and Sanitary Engineer Clyde Palmer directed the planning. George A. Odium is the contractor.

Clay Pipe is the *safe* pipe for sewerage lines that carry both residential and industrial wastes. Clay Pipe permits unlimited industrial expansion—because it handles any concentration of corrosive chemicals that future growth may bring. It protects residents from danger of epidemics and disease . . . is unaffected by acids and gases formed from any mixture of wastes in the line. It *never* wears out. The manufacturers of Vitrified Clay Pipe cooperate to make this fine product even better through research and testing. You can be sure you're getting the latest and best when you use Vitrified Clay Pipe.

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CLAY DIGS NEVER WEARS OUT!
PIPE

National Clay Pipe Manufacturers, Inc.
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100 N. LaSalle St., Rm. 2100, Chicago 2, Ill.
206 Connally Bldg., Atlanta 3, Ga.

C-454-1

Washington news

Presented in cooperation with the American Public Works Association and through the courtesy of the Washington Office of the American Municipal Association.

Costs of Relocating Public Utilities

Representatives of 25 public utilities and public service organizations including the APWA met recently, in Washington, with officials of the Bureau of Public Roads to discuss the best means of complying with the Congressional mandate to the Bureau to make a complete study of the economic and legal implications regarding the relocation of public utilities occasioned by highway improvements. Big question is whether or not a recommendation will be made to include utility relocation costs among those items now eligible for Federal matching funds. At present, they are not. Both privately owned and publicly owned utilities are involved. Probable treatment will be for both of them to be under the same set of rules. The Commissioner of Public Roads is making the study in cooperation with state highway departments and other interested groups.

Highway Building Costs Drop

The cost index of the Bureau of Public Roads shows that the highway construction costs have turned down sharply since the 1953 peak. The index at the end of the first quarter of 1954 was back to the level of early 1951 and was only slightly higher than the average for the entire year 1948. Such factors as shortages, spiralling costs and shortage of bidders have virtually disappeared from the road and street building picture.

Federal Airport Aid

The Civil Aeronautics Administration has enumerated fifteen elements of a national system of airports in order to set up lists of eligible items for Federal airport aid. The 83rd Congress, 2nd Session, appropriated $22 million for reinstitution of the Federal-aid airport program for the fiscal year ending June 30, 1955. In establishing standards, the CAA is trying to insure the most efficient utilization of the project and administrative funds available for this year's work. The subjects listed as airport system elements are:

(1) Land Acquisition; (2) preparation of site; (3) runway paving; (4) taxiway paving; (5) aprons; (6) lighting; (7) buildings; (8) utilities; (9) roads; (10) automobile parking; (11) turfing and landscaping; (12) fencing; (13) sidewalks; (14) removal of obstructions, and (15) miscellaneous landing aids.

The elements which will receive priority in any local request for Federal matching funds are: (1) land acquisition; (2) grading; (3) drainage; (4) runway paving; (5) taxiway paving; (6) aprons; (7) field lighting; (8) access roads, and (9) fencing. New criteria exclude federal funds for buildings utilities, automobile parking, sidewalks, turfing and landscaping and miscellaneous landing aids. Top priority is accorded land acquisition and obstruction removal.

August Construction Activity

Expenditures for new construction rose in August, according to a joint report of the US Departments of Commerce and Labor. A good portion of the July-August increase resulted from expansion in public utility construction and highway work. The annual rate of spending on new construction is now at an all-time high of $36½ billion compared with 1953's record $35¼ billion. Public outlays for new construction under way during the first 8 months of 1954 were about the same for the 1953 period. Decline in Federal construction, exceptionally great insofar as military facilities are concerned, was offset by increased state and local government outlays, mainly for schools, roads, and sewer and water systems. Public construction stood at about $7½ billion for 1954 to date, at the end of August.

Study Provides the Answer to A COUNTY'S REFUSE PROBLEM

REFUSE collection and disposal problems were surveyed and recommendations made in respect to Delaware County, Pa., by the Eastern Division of the Pennsylvania Economy League, Inc., Charlton F. Chute, director, and Wilbur C. Webb, engineer. The Delaware County Planning Commission cooperated.

Delaware County is located between Philadelphia and Wilmington and, though it is the second smallest county in the state, it has a population of nearly half a million. Political subdivisions include one city, 27 boroughs, 11 first class townships and 10 second class townships. About one half of the area is rural in character.

Results of the survey, along with the recommendations, were published in an excellent and well-prepared mimeographed booklet "The Refuse Problem in Delaware County". Following is an abstract of some of the recommendations having broad general interest and application to other areas; but this abstract is small indication of the value of the publication.

Functional Areas and Controls—The county should be divided into four basic districts for disposal operations, sized to provide maximum economy for collection and disposal. This requires cutting across lines of political subdivisions and providing overall supervision and can best be supplied by county-wide control; a second choice is to use existing municipal water and sewerage authorities, for which amendment of the Pennsylvania Authorities Act would be required; an alternate would be joint operation by several municipalities through a contractural agreement and a board representing all participants. Legislation now permits such action.

It is recommended that vigorous effort be made to have the 1955 legislature amend the law to permit 3rd class counties to provide "collection and disposal of municipal and commercial refuse" and to broaden powers under the Authorities Act to include "refuse disposal plants" instead of only incinerators, as at present.

Discontinuation of Dumps—Disposal of refuse in open dumps should be discontinued immediately upon the establishment of an alternate method of disposal. Dumps endanger public health, lower property values and constitute general community nuisances. Opposition to dumps has, by reducing areas available, raised costs to as much as, or more than, sanitary methods of disposal.

Immediate use of Sanitary Fill—The sanitary landfill method should be adopted immediately by all communities using open dumps. In addition to the protection of health and property values, this method of disposal can be put into service immediately, it will reclaim dumps and submarginal land and it utilizes multi-purpose equipment. The cost of operating a fill is stated to be normally under $1 per ton; and the total cost for plant and equipment is reasonable. Estimates are: For a community of 10,000, a cost of about $8,000; for 50,000 people about $20,000; and for 90,000 about $25,000. There exists adequate submarginal land within a reasonable haul distance of the populated areas to meet the demands for disposal by this method for a number of years.

If granted additional powers to operate refuse disposal activities, Delaware County should make positive efforts to acquire or receive permission to use for a maximum period of time sufficient low land in Tinicum Marsh and other like areas for a landfill to receive refuse from all municipalities within a haul of about 6 miles. Such use should include the purchase, where possible, of sufficient land to provide a park to serve the people of the adjacent area in the future.

A desirable feature of the sanitary fill is that this method can be put into service immediately upon the purchase or rental of standard digging and compacting equipment and authorization to fill the land, whether by purchase, lease or use contract.

Incineration—Consideration of and preparation for future incineration of combustibles in Districts III and IV (the more populous and urbanized areas) should be considered. The decision as to when incineration should be adopted should not be made until sanitary landfill experience has been established. In addition, the Delaware County Incinerator Authority or other appropriate public body should negotiate with Haverford Township for the purchase of its incinerator which should then be rebuilt to a capacity capable of handling all combustible refuse from about 100,000 people in District II. A site for an incinerator should be acquired in District IV, if possible; if not the plant on the Haverford site might be enlarged to incinerate the waste, including garbage, from about 300,000 population and later a second plant could be built outside of Chester.

Better Ordinances—Although existing ordinances and regulations have been generally acceptable, it is recommended that each of the area subdivisions should have certain minimum and fairly standard regulations governing refuse storage, collection and disposal. These should include realistic provisions and adequate penalties; a legal designation of the agency or individual responsible for enforcement; a legally enforceable contract when a contract collector is utilized; and a consideration of the use of zoning to establish best locations for refuse disposal.

The municipal agency responsible for refuse collection and disposal is normally the public works department, but health departments often have this responsibility. If all refuse collection is contracted for, or if there is a cooperative project between several political subdivisions, public health departments could probably function best, since public health is the most important aspect of refuse handling. In a small community where there is neither a public works or a health department, a definite responsibility should be established by appointing some one individual or agency. The responsibility should, of course, be on a workable basis.

Financing—Various methods exist for financing refuse collection and disposal operations. The simplest of these is payment from general municipal funds; and the method had the additional advantage of eliminating the job, usually costly for the contractor, of collecting the service fees. Added funds may be necessary to finance disposal.

Records—In this, as in most other studies of refuse collection and disposal, very few accurate records were available. It is strongly recommended that records should be kept to include data on quantities and description of refuse, and the osts of all phases of operation broken

down into capital investment and operating expenses, with the latter item showing, labor, equipment and material items.

Collection Procedures

Size of Collection Area—Physical areas of collection must be large enough to permit efficient and economical operation, which will be affected by density of population, topography, political subdivision boundaries, tradition and the disposal operation. If collection is to be by contract, the size of the operation must be within the capability of the contractor. Units should therefore be of such size as to permit and encourage competition by as many qualified contractors as possible.

Contract and Municipal Collection—Contract collection should be continued under a suitable written contract as long as reasonable and competitive bids can be obtained. The contract should prescribe clearly the services to be rendered. Where reasonable bids cannot be obtained, collection should be by municipal forces. Questionnaires to the various municipalities indicated that average costs to the individual householders served by private collectors were about $6.50 per year. Under a municipal contract, there should be added about 15 percent for supervision and administration.

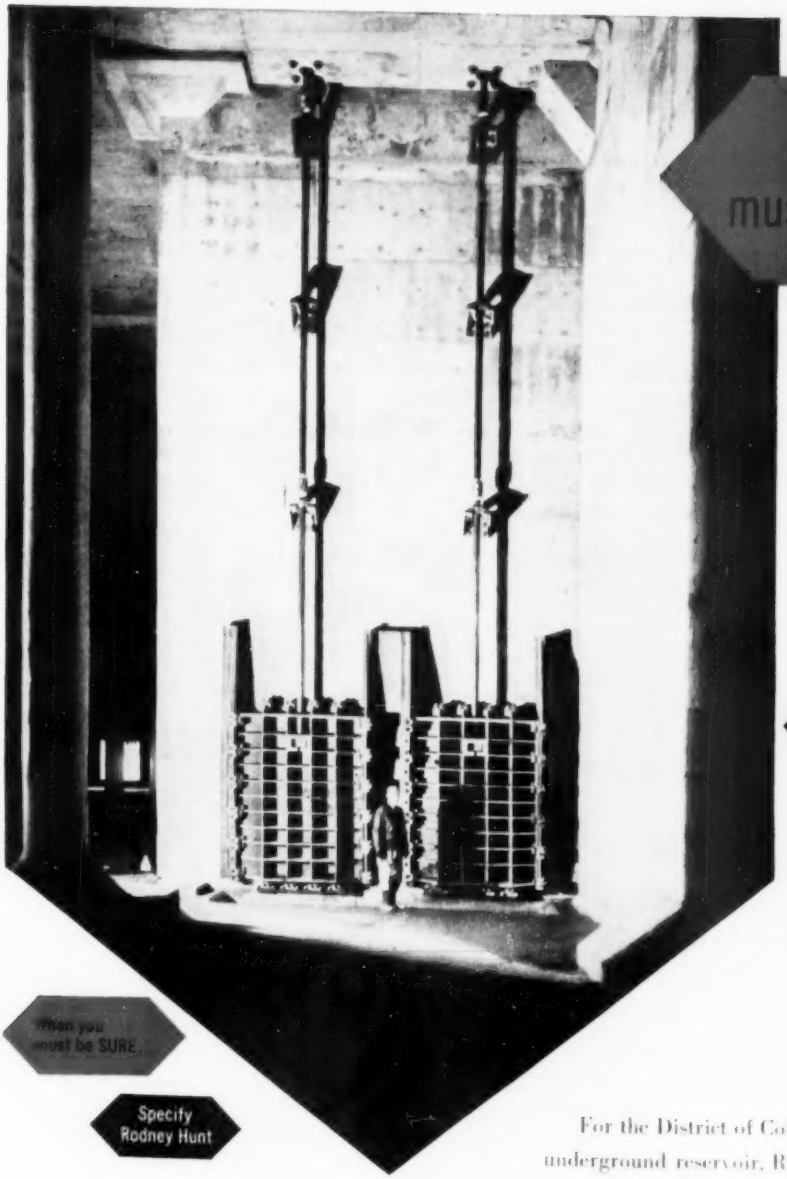
Collection and Storage—Refuse should be deposited by householders in containers that meet suitable specifications, and these should be located at the curb, roadside, alley or back door, as established by ordinance. Containers should be of metal, with tight covers, and with a capacity of 20 to 30 gallons. Maximum allowable weight when full should not exceed 100 lbs., and may be limited to 70 pounds. Garbage should be drained and wrapped; rubbish should be reduced to handleable pieces and boxed or tied into bundles.

Routes of Travel—The municipality should approve routes of travel for each collection vehicle. Care should be taken in routing to use streets of light traffic density as far as practicable and to avoid schools at arrival and departure times. Collections should be made during daylight hours and collection personnel should wear an identifying garment—at least a cap with badge.

Collecting Vehicles—All collectors of refuse should be required to use only the closed body type of unit, preferably the packer type, which greatly reduces littering. Vehicles should be kept clean; a weekly washing should be required. Many communities stipulate that the collection vehicles be painted a pleasing uniform color and that they be identified properly. Philadelphia has adopted a program of replacing all collection vehicles with packer-type bodies because of their advantage in traffic, the sanitation they offer and their economy.

Public Relations—A good public relations program should be a part of every refuse collection and disposal program. This may start with a "house card" explaining the refuse regulations. A well publicized arrangement for answering complaints efficiently and pleasantly is a good investment, as is a system for efficient follow-up on complaints. The public should be kept informed of what they are getting for their money. Collectors should be courteous and polite and drivers should obey all traffic signs, rules and regulations. Newspapers, radio, television, talks before civic groups and even door-to-door contacts can be used effectively in public education.

Finance and Records—The report gives careful consideration to the



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use of service charges, listing advantages and disadvantages. It also emphasizes the importance of keeping full and proper records and recommends that the contract with the collector include the requirement that specific records be kept by the contractor and made available to the municipality. These records should include the number and kind of establishments served, the magnitude of the operation for commercial businesses, the number and size of loads delivered at the disposal site, and such other data as may be desired.

Setting Up the Season's Road Work

Detailed Programs for Improvement of Secondary Roads are Developed Cooperatively by County and Townships

GUY M. ROWELL
Chairman
St. Clair County Road Commission
Port Huron, Michigan

DURING the winter and early spring, a detailed inventory is made by each of our district foremen of the physical needs required on the secondary road system in each township in our county. The money needs necessary to bring the system up to the required standard are then estimated. The inventory includes road surfacing, drainage, dust control, drainage structures and brushing. Each program is detailed on large scale township maps, showing the type of work and specific location, so that the township board may readily determine when and where work is to be done. In April and through May, meeting dates are set with each township board when our Engineer-Manager, the district foreman and one or more commissioners go out to the township hall and set up the program for the current season's work.

After the township board has agreed upon the improvements to be made, a detailed estimate of each project, showing the road name, log, quantities of material and amount of work and estimated cost, is made in duplicate and referred back to the township board for approval. As work progresses during the construction season, periodic statements are made and referred to the township for partial payment.

We are completing our seventh year of this program, and have found that by having the district foremen in attendance at these meetings, the various township boards gain respect for their judgment and rely upon their recommendations for setting up their annual programs.

Throughout this entire procedure, we strive to maintain the position that these programs are voluntary on the part of the townships. We take their recommendations as to what work should be done and where, and in no case do we attempt to dictate to them in this respect. Our commission feels that going out and meeting with them instead of having them come to us, has had a very beneficial effect toward good relations between road commission and township boards.

The old saying "Proof of the pudding is in the eating", surely holds true when we make an appraisal of results obtained. During the seven years of this program, over 681,320 cubic yards of processed gravel or crushed limestone have been placed; 60.6 miles of roads have been improved through grading and drainage operations, and 100.0 miles of roadside ditching have been completed. Some townships are pro-

gramming hard surfaced roads and to date 11 miles of 2-inch compacted bituminous aggregate surfacing has been laid. Some 58 drainage structures, from 20 to 110-foot spans, have been repaired or replaced. There have been many other special projects.

Many of the townships are including a dust laying project in this program; some are treating 100 percent of their mileage, while others are placing liquid calcium chloride in front of each dwelling only.

During this six-year program, the townships have contributed in excess of $1,175,000 which was matched by the county in excess of $765,000 making a total expenditure of over $1,940,000.

We feel that we have made definite progress in getting our 1080 miles of secondary road system "out of the mud", and that if we are able to proceed on this basis, in the not too distant future, we will have brought the surfaces up to a point where more attention can be given to such items as grade improvement, drainage, roadside clearing, hard surfacing, etc.

These data are abstracted from a paper presented at the ARBA National Highway Conference of County Engineers and Officials, held in Columbus, Ohio.

Dust Laying on County Roads

The procedure followed for dust laying in 1953 by Wayne Co., Mich., was the same as in 1952. Some local roads are an important part of the highway system and the County furnished dust-laying services as it was deemed necessary for the safety and convenience of public travel. With regard to subdivision streets, residents apply to the township offices, and these applications are transmitted to the Board. Payment for the calcium-chloride liquor used by the Board is made by the township.

Power Sweeper Cleans Airport Quickly

Working a little over 2 hours per day, 7 days a week, a Wilshire power sweeper cleans passenger and loading areas totaling over 200,000 sq. ft. plus an inside service corridor 1125 feet long with an average width of 35 ft., plus 9 roads and sidewalks within the Philadelphia International Airport. This same job was formerly handled in a much less thorough manner in 7 working days by 3 men, each working 8 hours per day. The Wilshire saves 153 man-hours per week—enough to pay for itself in a few months.

Special Screed Used for Finishing Third Highway Lane

AWARDED a contract for putting in a concrete third lane on both slopes of a rather long hill near Chenango Forks, New York, The Pasquale Construction Co. of Endicott, New York, wondered just how they would finish off the surface of the 14-foot lane. Since it was a rather small job, they realized it would not be practical or economical to bring their large self-propelled road finishing machine on this job. Neither would it be very economical merely to slide a 2 x 4 back and forth as is sometimes done on very small jobs.

They decided that a Stow screed would be just the thing to do this job. Since it is easily portable, it is no trouble to move it to and from the job. The Stow "power pak", which consists of a 2-hp Briggs and Stratton engine and a vibrating head, makes this screed operate fast and leaves a smooth surface.

A self-propelled paving mixer was used to place the concrete. As this moved up the hill, the screed was pulled along by only 2 men. The concrete used had a maximum slump of 2 ins. The few rough spots left after the screed passed were touched up with hand trowels. Then a stiff broom was pulled across the width of the slab roughing the surface up slightly to give better traction. This gave a satisfactory finished surface.

PUBLIC WORKS DIGESTS

THE SEWERAGE AND REFUSE DIGEST

Activated Aeration At Wards Island Plant

Continual efforts are being made at New York City's sewage treatment plants to develop new procedures which will produce improved results and significant economies in both construction and operating costs. Among the products of these efforts have been the step aeration and modified aeration processes. During 1953 a new process was developed, called "activated aeration". In this process, primary effluent was aerated for 2.8 hrs. in the presence of the excess activated sludge from an adjacent unit. After final settling, the solids were wasted directly to thickening tanks, thus insuring process stability. Air requirements, averaging about 0.2 cu. ft. per gallon, were close to the minimum needed to keep solids in suspension in the aeration tanks and distribution channels. Process effluent, including that from the thickening tanks, averaged 31 ppm of suspended solids and BOD. The combination of activated aeration and activated sludge accomplished a reduction of 86 and 85 percent in the respective raw sewage suspended solids and BOD. These efficiencies were significantly increased when the activated aeration detention time was increased to 4.4 hr.

"Activated Aeration at the Wards Island Sewage Treatment Plant." By A. H. Chasick, Civ. Engr., Dept. of Pub. Wks. *Sewage and Industrial Wastes*, September.

Synthetic Detergents In Sewage Treatment

A systematic study of the biochemical behavior of the major syndets of commerce led to the following conclusions: All the principal anionic and nonionic types of syndets are susceptible to some degree of biological degradation, varying both among classes and among members of the same chemical type. Certain syndet types are readily available as bacterial food and therefore are subject to rapid biological stabilization; other types are stabilized at a relatively slow rate. Classification as anionic or nonionic substances has little biological significance insofar as biological sewage treatment or biological purification of receiving waters are concerned.

"Biochemical Degradation of Synthetic Detergents". By Richard H. Bogan and Clair N. Sawyer, Mass. Inst. of Technology. *Sewage and Industrial Wastes*, September.

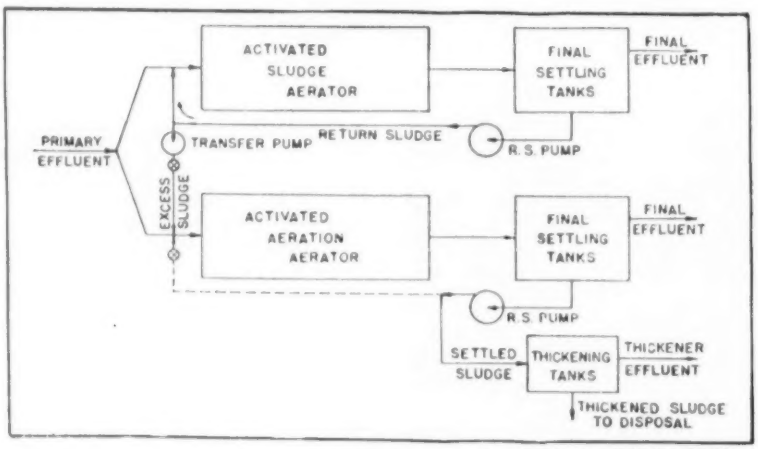
Public Health and Sewage Treatment

The author points out some of the factors in sewage treatment plants that affect public health, directly or indirectly. These he discusses under the heads of Plant Site; Screens and Grit Chambers; Settling Tanks; Imhoff Tanks; Aeration Tanks; Trickling Filters; Digesters; Sludge Disposal; Chlorination; Pump Stations; Plant Appurtenances; Meters and Flow Controls; Laboratory; Maintenance; Plant Shutdown; Future Planning; Plant Water Supply; and the Sewerage System.

"Public Health Factors in Sewage Treatment Plant Design, Construction and Operation". By Frank D. Wraight, Chief, Sew. Disp. Sect., Indiana State Bd. of Health. *Public Works*, October.

A Radio-Operated Sewage Station

Hopkins, Minn., a suburb of St. Paul with a population of 12,000 operates a sewage lift station with a 40-ft. lift by electricity; an overflow into Minnehaha Falls going into use if the pumps fail. But every effort is made to prevent the latter. To this end they have installed a Raytector radio transmitter and receiver, adapted from a bank hold-up alarm. If fallen wires or other power failure should occur, or if the pumps are automatically stopped for any pump failure, this system notifies city hall by light and buzzer. If it is power failure, a gasoline-operated generator is put into action at once to continue pumping until an emergency crew arrives. If the



Courtesy Sewage & Industrial Wastes

● **TYPICAL flow diagram of activated aeration operation at Ward's Island plant.**

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pump motors fail, a 500 gpm gasoline-powered trailer-mounted pump is brought to the station to pump from the wet well through a fire hose.

"Sewage Pump Station Gets a Radio Watchman". By Walton R. L. Taylor, City Manager. *American City*, September.

Home Refuse Incinerators In North St. Paul

When the village of North St. Paul, Minn., found it necessary to adopt some method of disposing of its garbage other than by the existing contract with a hog farmer for collecting and disposing of it, it considered sanitary land fill, a central incinerator, a central grinding station, and paying private collectors. The annual cost of each of these was estimated, including both initial investment and operation. Land fill was estimated to cost $10,550 a year; central grinding station, $16,400; central incineration, $13,350. Bids for private collection ranged from $6,600 to $18,000. If owners installed home disposal units, the annual cost of these was estimated to be $12; and if home owners paid farmers for collecting the cost would average $12. Land fill would cause depreciation of property values, and available land would soon be used up. The sewage of the village is treated in the Minneapolis-St. Paul plant, and objection might be raised to adding to the volume by either central or home grinding of garbage. The cost of installing either the sink grinder or a home incinerator would be approximately the same—about $125. Several home incinerators have been installed by home owners and they seem to be well pleased with them.

"Home Incinerators Help Solve Refuse Problem." By Gordon E. Olson, Village Manager. *Public Works*, October.

Aeration With Tube Diffusers

Two types of tubular porous diffusers are available, the ceramic tube and the Saran wrapped tube using stainless steel cores. Of 450 treatment plants using diffused air, approximately 100 have diffuser plates and 350 have diffuser tubes. Generally speaking, the smaller the bubble emitted by a porous diffuser, the greater the oxygen absorption efficiency; but the cost of compressing the air increases as the size of the bubble decreases. Air is used for both oxygenation of the sewage and for mixing. For the latter, a minimum of 3 cfm per foot of tank length is required. The total air requirement depends upon the strength of the sewage and the rate of its flow through the tank, the size of the tank, the type of process, and the oxygen absorption efficiency of the diffuser system. The author discusses the calculation of air requirements of a given plant, diffuser installation and maintenance, clogging of diffusers, filtering the air supply, and cleaning of diffusers.

"Designing and Maintaining Porous Tube Diffusers". By Miles Lamb, Chicago Pump Co. *Wastes Engineering*, September.

Composting City Refuse

Under this head, in the October issue of *Public Works*, there was given a brief digest of a report by an English committee which was quite unfavorable to the practice. In the same periodical (The Surveyor) in which this report was published there appeared, a month later, a criticism of the report by two members of the Institute of Civil Engineers who said that they both

had had "significant experience in the application of composting methods to the treatment of garbage and sludge" and are "independent of commercial interests in the composting process" They say that no member of the committee had had actual experience in composting and they had apparently consulted only one person who had. The report failed to consider the soil-conditioning properties of such compost. It considered composting as only a partial solution of the problem of disposal of sludge and garbage, but the critics maintained that even a partial solution deserved serious consideration. The cost comparison they considered to give an untrue picture. In fact, most of the data on which the committee based its conclusions were incorrect or incomplete and their use in drawing these conclusions indicated a bias unfavorable to the process.

"The Zuckerman Report on Towns' Wastes: Some Comments". By S. Averill Gothard and L. P. Brunt. *The Surveyor*, August 14.

Miami's New Incinerator

Miami, Fla., expects to complete this fall an incinerator with a daily capacity of 900 tons. The plant will include the largest waste-heat-steam generator in use by any incinerator. The steam so generated will, it is believed, supply the entire needs of a modern 1200-bed hospital, the medical section of the University of Miami, the City Water Department's 22 mgd steam turbine pumping station, and the city's garage and truck-cleaning equipment. Congestion of garbage trucks will be eliminated by a streamlined roadway system to the plant and an interior parking area for 80 trucks. The main building will entirely enclose the plant, including the 3,000-cu. yd. dumping pit and boiler plant. The incinerator will be the first of its kind to have complete spray-type fly ash eliminators.

"Miami Incinerators to Generate Steam for City". *The Constructor*, August.

Incineration Without Discharging Fly-Ash

The Green Bay Avenue incinerator of Milwaukee, Wis., with 300 tons capacity, has been operated by the city since Feb. 15th, 1954, at or near capacity. An interesting feature is the provision for complying with the Milwaukee County Smoke Regulation Ordinance, which specifies that flue gases discharged from any stack contain no more than 0.85 pound of dust per 1,000 lb. of flue gas, adjusted to 50 percent excess air. Exhaustive tests made by the County engineers have shown that the dust load is well below this limit. Each of the two furnaces discharges its gases into a 10.5 x 31.5 ft. combustion chamber, from which they pass into a common breeching which leads directly to the chimney. The breeching contains a baffle-plate assembly to trap and remove the fly ash. The bottom of the combustion chamber is depressed to hold a pond of water and much of the fly ash is trapped by contact with this. From 50 to 100 cu. ft. of semi-solid fly ash is deposited here each day and is flushed out each morning.

"Water Sprays Give Milwaukee a Fly-Ash Free Incinerator". *American City*, September.

Control of Blue-Green Algae

A large-scale test of the effectiveness of 2,3-dichloronaphthoquinone (2,3-CNQ) in controlling excessive growths of blue-green algae has

been carried out on Spauldings Pond, Wis. This 27-acre, highly fertile lake normally supports a continuous bloom of algae during the summer months. Spray applications of 2,3-CNQ suspensions to give over-all concentrations from 30 to 55 ppb in the lake clumped and effectively killed even heavy growths of the blue-green species, but with no observable harmful effects on green algae, higher aquatic plants, fish, or zooplankton. The lasting effect of treatment may be increased indirectly by vigorous growth of green algae and higher aquatics following the suppression of the blue-greens.

"Control of Blue-Green Algae Blooms with 2,3-Dichloronaphthoquinone". By George P. Fitzgerald and Folke Skoog, Dept. of Botany, Univ. of Wisconsin. *Sewage and Industrial Wastes*, September.

Effects of Nitrogenous Compounds on Streams

There is no significant difference in the use of inorganic forms of nitrogen by plankton typical to streams having moderate amounts of pollution containing fertilizer elements. Higher concentrations of nitrogen appear to accelerate the growth of algae as long as the concentrations are not toxic to the organisms. The nitrite form of nitrogen, which appears less efficient a fertilizer in higher concentrations, may easily change into ammoniacal or nitrate form and become more readily available for plant use.

"Effects of Nitrogenous Compounds on Stream Conditions". By Norman G. Flaigg, U.S. Bureau of Reclamation, and George W. Reid, Assoc. Prof. of San. Eng. Univ. of Oklahoma. *Sewage and Industrial Wastes*, September.

Food and Power From Sludge

Studies of the growth of green algae in sewage, which have been under way at the University of California Engineering Research Laboratory for four years, have shown that they made be made to play a vital part in photosynthetic oxygenation of sewage provided that environmental conditions are within certain limits. Also, that a symbiotic process could be established in which oxygen produced by the green algae would meet the oxygen demand for bacteria and other organisms oxidizing the waste organic matter. Also that the algae produced large amounts of algal cell material, and that 1,000,000 gal. of domestic sewage would yield up to a ton of dry algal cell material. This had a protein content of 40 to 60 percent. Studies are being conducted to determine if a practical method can be developed for producing this material for use as an annual food supplement or perhaps for fuel. It is calculated that the urban sewage and organic industrial wastes of the United States, if so treated, could potentially produce the entire protein demand of the men and animals of the country, and would yield 4 times as much energy as would the gas of digestion.

"Algal-Bacterial Symbiosis May Produce Food for All." *Public Works*, October.

Biocatalytics In Waste Treatment

A special committee appointed in January 1954 by the California Sewage and Industrial Wastes Association to investigate the efficacy of biocatalytic additives has reported that questionnaires were

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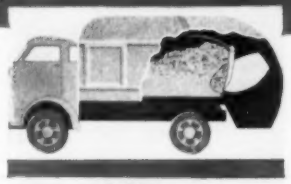

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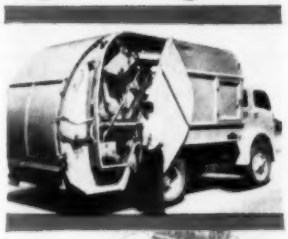

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sent to all members and replies received from 61 plants. Of these, 43 had not used these additives. Of the 18 that had used them 12 did not plan to continue using them, one, not unless a "duly recognized competent authority can show that there is a definite benefit"; one had not obtained enough conclusive results to date. Only one expected to continue using them. The committee said that "it is possible that the enzymes in these substances may exert beneficial action on scum blankets or clogged grease" and may improve the performance of percolation and oxidation ponds, especially during the initial operation of ponds used for seasonal organic industrial wastes. Controlled experiments should be conducted by recognized authorities in sewage works laboratories, universities, or by well-known consulting sanitary chemists or engineers.

"Biocatalytic Additives in Waste Treatment". By J. E. McKee, Ben Benas, W. L. Henderson, R. R. Kennedy and E. Pearson, special committee. *Sewage and Industrial Wastes*, September.

Compacting Refuse Dumps

At the annual Public Cleansing Conference in England this fall, the use of heavy machinery, like bulldozers, for compacting refuse dumps was discussed. One of two speakers condemned such use, advocating the "controlled tip" without compacting, saying that refuse disposed of by the American Sanitary landfill method remained in an offensive state a year after being tipped, while that disposed of by controlled tipping without compacting was decomposed after six months, due to the access to it of air and rain. In controlled tipping, the refuse is separated, old mattresses and the like being laid at the bottom of the tip; bundles are opened and the contents spread; hollow containers are filled with refuse; all with a view to providing access for air and rain, and drainage of the tip.

"Measuring Progress in Public Cleansing". *The Surveyor*, August 21.

Effect of Syndets On Settling of Solids

Experiments conducted by the authors and others on the influence of syndets on the settling of suspended solids in sewage led to the conclusions that no adverse influence resulted from the pressure of Teepol (a secondary alkyl sulfate) or Lissapol N (a polyglycol ether of an alkylated phenol) in concentrations of 25 to 75 ppm active matter. No indications have been obtained that less (and/or more bulky) sludge has settled under the influence of these types of syndets.

"Effect of Synthetic Detergents on the Settling of Suspended Solids." By P. N. Degens, Jr., H. Van der Zee and J. D. Kommer, Royal Shell Laboratory and Netherlands Public Works Dept. *Sewage and Industrial Wastes*, September.

Other Articles

"The Evolution of the **Activated Sludge** Process in Great Britain." By William T. Lockett, Chf. Chemist, Middlesex County Main Drainage Dept. Contractors Record (England), August 11.

"**Installment Buying** of Sewage Plants" in Pennsylvania under the Municipal Authorities Act. By Samuel I. Zack. Engineering News-Record, Sept. 7.

"**Cincinnati's** Littte Miami Sewage Treatment Plant", for primary treatment of 29 mgd. By Arthur D. Caster,

Sew. Disp. Engr. Public Works, October.

"County Landfill Eliminates Open Dump" in Maricopa Co., Ariz. By Dean Smith. Public Works, October.

"Destruction of **Oxalic Acid** by Activated Sludge". By Donald J. Nelson, USPHS, and Leo M. Reading and C. W. Christenson, U.S. Atomic Energy Comm. Sewage and Industrial Wastes, September.

"Maintenance in Operating Waste Collection Equipment, There's No Substitute For Good". By Sylvester Sorrentino, Supt. of San., Hempstead, N. Y. Public Works, October.

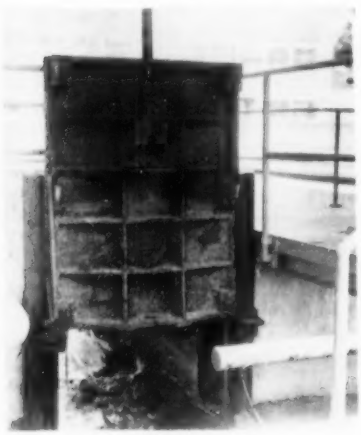
"Aeration Unit Followed by High-Rate Filtration, Notes on Six Months' Operation of a Partial Treatment". By M. A. Kershaw, Sewage Works Mgr., Slough, England. Contractors Record, Aug. 25.

Where SLUICE GATES Are Used in a Modern Sewage Treatment Plant

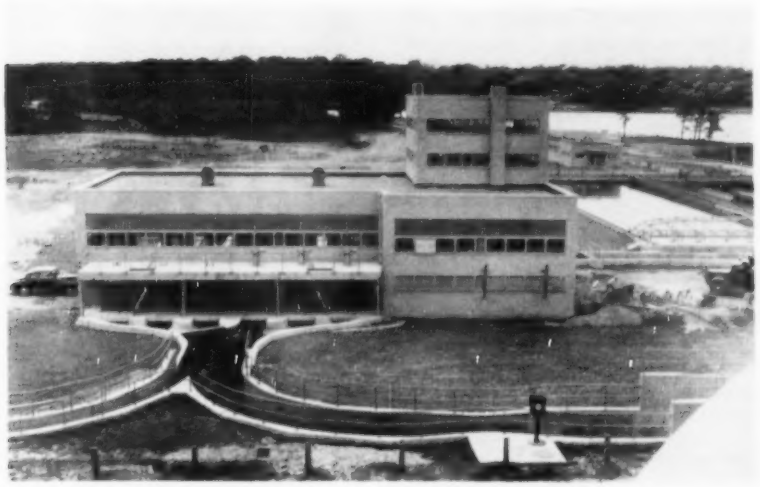
IN the recently completed Blackstone Valley sewage treatment plant, at East Providence, R. I., twenty Rodney Hunt sluice gates have been installed to control sewage flows, and wall thimbles are in place to facilitate placement of nineteen other gates to provide for a probable needed doubling of the plant capacity. There are five 96 x 120-inch gates and fifteen smaller ones. The sluice gates, which are operated by Limitorque valve controls are used to control the flow from the grit channels to the aerator basins or to a by-pass line.

Parshall flumes pass the incoming sewage to the influent gates of the screen and grit building. In the initial construction, there are three grit channels, but provisions are made for later construction of duplicate facilities. After screening and grit removal, the sewage flows to settling tanks, where 3 hours detention is provided. After digestion, the sludge is dewatered on vacuum filters. The sewage arriving at the plant contains much industrial waste, including dyes which often color the flow bright red, purple or green, depending on the operations of the mills.

Metcalf & Eddy of Boston were consulting engineers on this project for the Blackstone Valley Sewer District Commission. The contractor was F H. McGraw & Co. of Hartford.



● **OVERALL view of Blackstone Valley plant, and closeup of 48" x 60" Rodney Hunt bronze-mounted sluice gate installed at the plant.**



PUBLIC WORKS DIGESTS

THE HIGHWAY AND AIRPORT DIGEST

Sawing Contraction Joints

Sawing contraction joints is economical and efficient. The method and equipment are comparatively new, and some points about the best procedure have yet to be developed by experience. The most important is: How soon after the concrete has been placed should the joints be sawed? Early sawing reduces the life of the saw blade and may produce ravelled joints, while late sawing can result in poor control of contraction cracking. The Omaha District Corps of Engineers has developed a sawing technique for sawing joints in thick pavements for military air fields. The temperature of newly placed concrete rises while it is setting, then falls back to normal. Contraction cracks form as the concrete cools. Therefore the best time for sawing is just after cooling begins. This time varies with air temperature, thickness of slab, and other related conditions. In the case of 20-in. airfield pavements, maximum temperature was reached in 8 to 21 hrs. and the first visible cracks appeared in 20 to 33 hrs. after placement. With thinner pavements the times would be considerably less.

"Contraction Joints—When to Saw Them." By Herbert B. Erickson, Asst. Materials Engr., Omaha Dist. Corps of Engineers. *Engineering News-Record*, Sept. 16.

Maintenance By Contract

Last year, of $600 million expended for maintenance of state highways, $100 million was for contract performance. Much of this was for surface and structural repairs and painting, and production of aggregates; but other items contracted for were equipment repairs, crack sealing, snow removal, guardrail painting, and chemical application. Establishing a unit of work on which to make payment, and the availability of enough contractors who are experienced in the type of work to be performed and have experienced men and suitable equipment are essential.

Future highways, said S. E. Ridge, of the BPR, will cost more to maintain than today's average highways because there will be more surface to be maintained, shouders are wider, there are median stripes to be maintained, more numerous and larger signs, more permanent lane markings, more grade separation structures, elaborate drainage structures, and parking areas and picnic grounds.

"Super-Highway Maintenance by Contract". *The Constructor*, September.

Yield Signs Replace Stop Signs

The use of "Stop" signs at intersections to reduce accident hazards and facilitate traffic movement has proved effective for the former when sensibly used and enforced, but not to facilitate traffic flow. After trying several substitute signs, including "Dangerous Intersection" and "Slow", several cities are using "YIELD right of way". Dallas, Texas, has installed these at more than 75 isolated intersections and to protect secondary thoroughfares, and finds the observance very good. Portland, Oregon, has tried them at 14 intersections carrying averages of 4,000 vehicles a day. Accidents were reduced at 9 of these and the city felt justified in expanding the use of "Yield" signs to minor intersections of one-way streets. Oklahoma City has "Yield" signs at 60 intersections. For the year following their installation the accidents were 9 percent less than for the year preceding. Winnipeg, Manitoba, erected 7 "Yield" signs in January, 1953; no definite results can be given yet, but the principle appeals to the motorist. At Tulsa, Okla. a study was made of driver reaction at 5 intersection where Y signs had been installed and the result was so favorable that "Yield" signs were placed at more than 50 additional intersections.

"Yield Signs to Reduce Stop Sign Nuisance" By Paul W. Rice, Traffic Engr., Evansville, Ind. *Public Works*, October.

Guide Signs With Color Backgrounds

Arizona highway engineers last year adopted a type of signs with color backgrounds which tell drivers what direction they are going in. Orange indicates north, green indicates south, brown is for east and blue for west. These are used as background colors on route markers as well as distance and direction signs. The messages are silver on all but the orange backgrounds, where black is used. The signs are over-all reflectorized for night visibility. The reflectorized color is obtained by silk-screening transparent pastes on silver "Scotchlite" brand reflective sheeting. These signs are especially useful in cities, where motorists may become confused in following a route through unfamiliar streets. Officials report that the use of these signs has reduced traffic congestion, both day and night as well as being helpful to drivers.

"Direction by Color Signs for Arizona". *Roads and Streets*, September.

Snow and Ice Control in Wisconsin

In Wisconsin the State Highway Commission arranges with the highway committee of each of the 71 counties to use county men and equipment for practically all maintenance work on the 11,000 miles of rural state trunk highways, under the supervision of the state commission. County machines are paid for at estabished hourly rates and county labor at prevailing wages. Each year the state uses 150,000 to 175,000 cu. yd. of abrasives, mixed

with either sodium or calcium chloride to prevent freezing in stockpiles. Front-end loaders attached to tractors are used quite generally for loading from stock pile to truck. Seven sand bins of up to 130 cu. yd. capacity facilitate rapid sanding of icy roads. Before winter starts, 5,821,000 ft. of snow fence is erected. The 71 counties own and operate 3,535 trucks, 863 motor graders, 744 sanders, 2131 plows (including 37 rotary), and 673 tractors. Nearly half of the county highway departments are equipped with two-way radio communication. The average annual expenditure for snow removal has been $134 per mile; for ice control, $110, and for drift prevention, $37.

"Paul Bunyan's Homeland Prepares for Winter". By M. W. Fisher, Engr. of Maint., State H'way Com. *Public Works*, October.

Cutting Concrete Culvert Pipe

A better way of cutting reinforced concrete culvert pipe in the field by use of explosives is being developed by the United Concrete Pipe Corp. and the Atlas Powder Co. Atlas 100-grain primercord is wrapped around the pipe where the cut is to made and detonated with electric blasting caps. The blast travels through the primercord at a speed of approximately 18,000 ft. per sec., making a distinct, clean crack completely around the inside of the pipe. It is estimated that this method saves 75 to 80 percent of the labor cost involved in the current method of cutting, and gives a cleaner cut. Disadvantages are noise, concussion and the dangerous characteristics inherent in any explosive.

"Cutting Reinforced Concrete Pipe With Explosives". *Public Works*, October.

Rubber in Cement-Soil Bases

Experiments are being carried on in England, initiated by the British Rubber Development Board, to determine the possibility of increasing the elasticity of a soil-cement slab by the addition of rubber latex. In 1952, the base of a short length of road, the greater part of which had a normal cement-stabilized soil base, was tested with rubber latex in addition to the 10 percent cement. It is difficult to say what, if any, was the effect of the rubber, since both sections are still giving satisfactory service. In 1953 another experimental base was laid for a road carrying very heavy industrial traffic. In this were used 7½ percent portland cement and 2½ percent bituminous emulsion, the latter containing dry rubber added in the form of 60 percent centrifuged ammonia-preserved natural rubber latex. The rubberized emulsion was thoroughly mixed with the soil; then the cement was added and thoroughly mixed, and the mixture compacted at optimum moisture content. In addition, laboratory experiments were made with beams 3 ft. 6 in. long, 4 in. wide and 6 in. deep to determine the comparative resilience or flexibility of cement-soil mixtures with and without rubber. Both beams broke at approximately similar loads on the center but much greater deflection occurred in the case of the beam containing rubberized bitumen.

"Flexibility as a Factor in Design of Stabilized Soil Bases". By H. E. Brooke-Bradley. *Roads and Road Construction*, August.

Rubber-Asphalt Paving Mixtures

The Bureau of Public Roads is following with close interest the performance of the many experimental rubber-asphalt pavement sections that have been laid recently. Meantime it has conducted laboratory tests of its own, and has just pubblished its tentative conclusions from them. One set studied the properties of rubber-asphalt blends alone; the other studied mixtures of these with aggregates. The character of the blends was affected by the type and amount of rubber used, the nature and source of the asphalt, and the temperature, time of heating, and amount of stirring in the preparation of the blends. In general, the addition of rubber increased the softening point and viscosity of asphalts and decreased their penetration, flow, susceptibility to temperature change, and ductility at 77° F. Generally, the low-temperature ductility of the asphalts was not very much influenced by the addition of rubber.

When, in preparing rubber-asphalt paving mixtures, powdered rubber was used, the compactibility of the paving mixture was lowered and there was higher susceptibility to temperature change than in the comparable mixes without rubber. Mixtures of aggregates with preblended rubber were much more compactible and stable than when the rubber was added as a powder. Tests failed to indicate that bituminous surfaces containing rubber

would be both substantially more plastic at low temperatures and less plastic at high temperatures than surfaces without rubber. In general, mixtures containing synthetic or reclaimed rubber, in either powder or preblend form, were more plastic at both 77° and 140° F. than the control mix without rubber. Mixtures of Ottawa sand and preblends of asphalt and natural rubber were more resistant to abrasion than mixtures without rubber or any other rubber-asphalt mixtures.

These tests indicate that "the effects of the addition of different rubbers to different asphalts may vary widely: the use of rubber shows promise of benefits in some respects; in others it does not. Conclusions as to benefits of real economic value in the addition of rubber to asphalt must wait on further observation of the behavior of experimental pavements under the influence of age, weather, and traffic. None of these experimental pavements have as yet shown significant behavior differences between comparable rubber-asphalt and plain asphalt sections."

"The Effects of Various Rubbers on the Properties of Petroleum Asphalts"; "A Laboratory Study of Rubber Asphalt Paving Mixtures." *Public Roads*, October.

Up-to-Date Parkway Signs

The New Jersey Highway Authority plans to embody the most modern trends in safety and appearance in the signs to be placed on the new 165-mile Garden State Parkway. Consideration is given to visibility, location, readability, psychology, safety, appearance, and economy in both initial and long-range cost. The signs are placed 16 ft. from the edge of the pavement and 5 ft. above the road crown. Various color combinations are used, and different shape, each for a definite kind of information and to combat monotony. The color combinations include green on white, blue on gold, silver and gold on green, red on green and black on yellow. All are reflectorized, using reflective sheeting having the ability to reflect color. Road tests showed that such signs having 8 in. lettering are visible at night from a distance of at least ½-mile and are readable from 500 ft. Aluminum alloy is used for the backing. Signs are mounted on 4 x 4 to 8 x 8-in. red cedar posts stained tobacco brown and treated with preservative at the grade line.

"Up-to-Date Signs for New Jersey Parkway." *Better Roads*, September.

Photographs Promote Good Construction of Highways

The Virginia Dept. of Highways uses photographic slides showing improper workmanship and its results in an effort to impress field personnel with the necessity of good construction. Still pictures are used rather than motion pictures because they are more vivid, easily available and comparatively inexpensive. These slides were used to remind the personnel that their work is constantly under observation by both officials and public; also in connection with a refresher course given to instructors covering general construction work and interpretation of specifications and plans. They also serve to correlate the efforts of designers with those of engineers and inspectors; several improvements in standard plans and specifications have resulted from discussion panels where these slides were used to illustrate points.

"Virginia Accentuates the Nega-

POLICE RADAR DROPS DEATH TOLL

POLICE RADAR CREDITED WITH DROP IN DEATHS

Radar, a wartime developed detection device, has been aimed at highway

ENFORCEMENT OFFICIALS CREDIT
ELECTRO-MATIC® RADAR SPEED METER
WITH CUTTING HIGHWAY DEATH TOLL

NATIONWIDE SURVEY CITES RADAR

Most reports from states using Electro-Matic Radar Speed Meter say it's cutting down accidents. The latest state to install it and the state which pioneered radar's use in patrolling highways are equally enthusiastic about the results, an Associated Press survey found.

Virginia State Police, one of the first users of radar, in an expanded program credit radar for the reduction in the death toll on the Fourth of July weekend. There were only 7 deaths this year compared to 21 last year.

Radar Speed Meters have been used for a year by the

Kansas highway patrol. They note a 12 per cent reduction in traffic fatalities and conservatively say radar "may have played some part."

Mississippi State Police credit radar with a 77 per cent reduction in traffic accidents.

HOW THE SPEED METER WORKS

Continuous speed measurements of vehicles approaching or receding in the path of a radar beam are taken directly with the Model S-2 Speed Meter. Speed readings are plainly and directly indicated in miles per hour, day or night and under all weather conditions, on the illuminated meter scale or on the chart of the auxiliary Graphic Recorder.

Readings of speeds up to 100 mph are accurate within 2 mph. The Speed Meter can be set up and operating in less than three minutes on either car battery or 120 volt A.C. power. A single ON - OFF switch is the only control necessary for operation.

Either one-man or two-man usage of the S-2 Speed Meter is practical. Under the one-man system the Transmitter -

Receiver Unit is connected by a small cable to the Indicator Unit at the point down the road where the officer is stationed. Departments that favor two-man usage utilize two cars, the first car mounts the Radar Speed Meter and is in radio-telephone communication with the intercepting car at a suitable location down the road.

MANY ADVANTAGES OFFERED

1. Police can check far more vehicles than with a cruiser car.
2. Hazards to pursuing officers and motorists are eliminated.
3. It is effective day and night and in all weather.
4. Psychological deterrent to would-be speeders.
5. Portable for spot checking.
6. Ideal for investigating complaints of neighborhood speeding.
7. Either one-man or two-man usage of the Speed Meter can be employed.

For full details write for Bulletin R-102 to

AUTOMATIC SIGNAL DIVISION
EASTERN INDUSTRIES, INCORPORATED
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tive." By D. B. La Prade, Asst. Chief Engineer's Aide. *Better Roads,* September.

Other Articles

"Road Foundations, The Design of". A general treatise. By D. J. Maclean. The Surveyor, August 14.

"Slippery When Wet Road Problem, Solving the" using a special abrasive material. Public Works, October.

"Reconstructing a Texas Highway, Procedures in". Public Works, October.

"Signs, Striping and Traffic Control Signals in Arizona". Public Works, October.

"Pavement Patching Train, The Austin, Texas". By Guy Browning Arthur. Public Works, October.

"Maintenance of High-Speed, High-Traffic Highways a Difficult Problem." By S. E. Ridge, Chf. Maint. Control Sect., BPR. Civil Engineering. September.

"Concrete Paving Methods at Abilene Air Force Base". Roads and Streets, September.

"Electric Heating and Temperature Control" in hot mix plant on Jersey Parkway. Roads and Streets, September.

"New Ideas in **Street Widening** Produce Economical Results." By Linas H. Brown, Public Works, October.

"Developing a County's Roads in **Dry Southwestern Kansas**". By Thomas B. Quinn, County Engr. Better Roads, September.

"Acquiring Land for State Highways". A Forum article. Better Roads, September.

Economics of paving country roads. "Should a Community Pave All Its Roads?" By Benjamin Schwartz, N. Y. State Dept. of Pub. Wks. Better Roads, September.

• • •

Record Highway Program

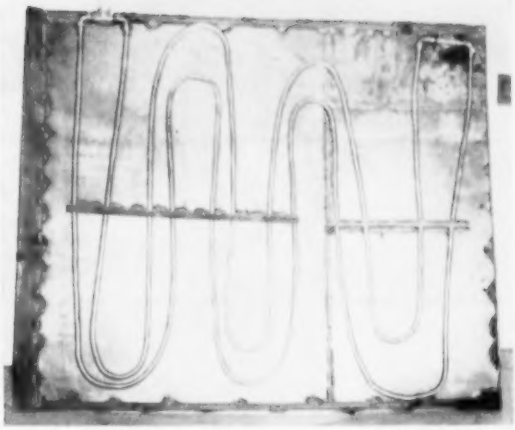
Expenditures of the Pennsylvania Department of Highways for construction, reconstruction and widening during the fiscal year 1953-54 set a new record-breaking mark of $138,570,000 according to Secretary of Highways E. L. Schmidt

• • •

FROZEN SAND
Thawed by Exhaust Heat

J. H. WIGGLESWORTH
City Manager,
Lawrence, Kansas

EVEN though Lawrence, (pop. 25,000) is located in traditionally flat Kansas, there are many streets



● **EXHAUST connection leads up to truck body. View at right shows copper pipes and reinforcement on underside of false bottom.**

leading to Mount Oread, site of the University of Kansas, which are quite steep. When snow and sleet strike it is necessary to sand these streets, if traffic is to move.

For this purpose we use the Flink spreader, which is an hydraulically operated attachment that replaces the tail gates on the trucks and does an excellent job of spreading sand or other material.

Our sand comes to us wet, and in the cold weather that prevails when we need sand on the streets, it freezes in cakes about an inch thick on the bottom of the truck bed. When these frozen chunks reach the spreader mechanism, they cause an uneven spread, and in some cases actually clog the feeder. To avoid this inconvenience, we have built in our shop, false bottoms for the truck beds which have on their bottom side a double coil of one-inch copper pipe. This false bed, made of used ⅛" boiler plate, is placed in the truck bed and connected to the vehicle exhaust. Support and rigidity are provided by angle irons welded to the sheet. The connection is made at the hinge point of the dump bed and is made of flexible tubing so as not to interfere with the raising of the bed. The exhaust heat is more than enough to keep the sand in the bed from freezing to the floor. The past season has proven the worth of this inexpensive addition.

PUBLIC WORKS DIGESTS

THE WATER WORKS DIGEST

Watersheds in The Northwest

This article is a panel discussion describing watershed and reservoir control in 6 Pacific Northwest communities—Medford, Portland, Bremerton, Seattle, Tacoma and Vancouver. The watersheds are large, ranging in size from 15,000 to 145,000 acres. The conditions, problems and practices are described under the heads: Historical Development, Land Ownership, Forestry and Logging, Sanitary Protection and Policing, Public Entry for Recreation and Algae and Weed Control. Five of these six cities have organized police patrols; the sixth, with a spring supply, has only a casual patrol. All the cities control or prevent habitation on the watersheds. And all rigidly test the waters for contamination. Public entry is prohibited (with exceptions in special cases) by Portland, Seattle, Tacoma and Vancouver. None of the cities experienced serious algae trouble; such as they have is controlled by use of copper sulfate; also, in some cases, chlorine, ammonia, and hypochlorite.

"Watershed and Reservoir Control in the Pacific Northwest". *Journal AWW Ass'n.*, August.

Effects of Syndets On Water Supplies

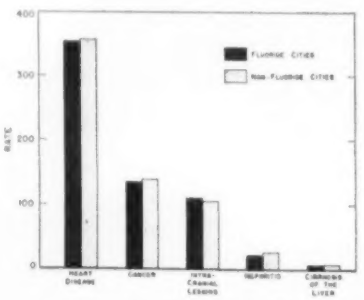
A committee of the AWWA, appointed last year to investigate and report on the effects of detergents on water supplies, has presented a preliminary report giving "background information" — definitions, chemical and physical properties, and analytical methods; followed by a review of the literature relative to toxicity to humans, effects on surface waters and effects on treatment of water and of sewage.

This toxicity to humans would seem to be of minor importance. One case of death due to drinking a 10 percent solution has been recorded, but that might happen with numerous other substances not intended for ingestion. Normally, detergents would reach surface waters only as minor constituents of sewage or sewage effluents. They may increase the BOD of sewage; the chief objection to them seems to be as a nuisance in causing foaming. In treatment of water, syndets were reported by a few cities as possible causes of tastes or interference with coagulation. The only really serious trouble was experienced at Wheeling, which has received considerable publicity.

"Characteristics and Effects of Synthetic Detergents." A task group report. *Journal AWW Ass'n.* August.

Effect on Mortality of Fluorine In Water

Dr. Thomas L. Hagan, Chief, Div. of Dental Public Health, studied specific mortality data from 32 communities with fluoride-free water supplies (those containing 0.25 ppm or less of fluoride), and compared them with similar data from 32 nearby communities whose water supplies contained 0.70 ppm or more. The total population of the "fluoride" cities was 892,625; that of the "nonfluoride" cities was 1,297,500. These data show no statistically significant differences between the mortality rates of the two classes of cities for all causes, or for specific cases of heart disease, cancer, intracranial lesions, nephritis, or cirrhosis of the liver.



Courtesy Water Works Engineering

● DEATHS from certain causes in cities with and without fluorine in the water.

"Fluorine in Water Seems to Have No Effect on Mortality." *Water Works Engineering*, September.

Pump Stations For Residential Areas

San Bernardino, Calif. operates 20 pumping stations housing deep-well pumps. Some of these are located in or near residential districts. When this is the case, the station is designed and constructed similar to the type of architecture in that district. The latest design contains a shed similar in appearance to an attached garage, covering the well itself. This shed is so constructed that, by opening the overhead garage door, it can be rolled away from the concrete floor slab, so that the pumping equipment can be worked on. To lessen the noise of operation of the equipment, all ceilings and some walls have acoustical boarding. Inside the main building are the booster pump, with electrical automatic controls, and a suction storage reservoir.

"Camouflaged Pump Stations for Residential Areas". By Alan W. Farrant. *Public Works*, October.

Plastic Pipe For Water Lines

During the past two years a study has been in progress at the laboratory of the National Sanitation Foundation in the School of Public Health, Univ. of Michigan, to determine possible effects of plastic pipe upon the safety, quality and palatability of water delivered through it, as well as possible deleterious effects of the water upon such pipe. Samples of 23 pipes were tested, using waters of various pH and CO_2 content. No objectionable substances were extracted from the

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No matter what the season, whether Spring flood or Summer drought, there is always a turbidity problem to some degree. And an effective coagulant for any water treatment problem is TC FERRI-FLOC, a partially hydrated ferric sulphate. A stable, free flowing granular salt, FERRI-FLOC may be fed with few modifications through any standard dry feed equipment. Only mildly hygroscopic, it permits ease of handling and closed hopper storage over long periods of time.

Water Treatment
Ferri-Floc coagulates surface or well waters, and it aids taste and odor control. It is effective in lime soda-ash softening, and is adaptable to treatment of practically all industrial water or wastes.

Sewage Treatment
Ferri-Floc coagulates waters and wastes over wide pH ranges. It provides efficient operation regardless of rapid variations of raw sewage, and is effective for conditioning sludge prior to vacuum filtration or drying on sand beds.

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1 *Rapid Floc Formation* 2 *PH correction* 3 *Taste and odor control* 4 *Color removal* 5 *Softening* 6 *Ease of operation* 7 *Bacterial removal* 8 *Manganese and Silical removal* 9 *Turbidity removal* 10 *Economy*

SULPHUR-DIOXIDE SO_2

SULPHUR-DIOXIDE is effectively used for dechlorination in water treatment and to remove objectionable odors remaining after purification.

COPPER SULPHATE

COPPER SULPHATE will control about 90% of the microorganisms normally encountered in water treatment plants more economically than any other chemical.

Get full details of this month's products . . . mail your Readers' Service card today.

types of pipe recommended by manufacturers for use with potable water supplies. Rats supplied for 6 months and more with water that had been in contact with plastic pipes showed no abnormal conditions.

Manufacturers of thermoplastic pipe have formed the Thermoplastic Pipe Division of the Society of the Plastics Industry, and have established a standard for sizes and working pressures for polyethylene pipe.

"Studies on Plastic Pipe for Potable Water Supplies." By Walter D. Tiedeman, Exec. Dir., School of Public Health, Univ. of Mich. *Journal AWW Ass'n.*, August.

Cloud Seeding For Weather Control

Nature very seldom releases more than 5 percent of the water passing overhead in storm winds. Cloud seeding merely increases the rate of fallout of water from a storm over the area where the additional water is desired. The art of cloud seeding depends on: 1. The use of effective nucleating materials in concentrations related to rates at which the atmosphere resupplies moisture to cloud systems. 2. The ability of the operator to recognize weather situations suitable for cloud seeding. 3. The ability of the operator to maintain the influence of cloud seeding operations over a specific area for the duration of a natural rainstorm. 4. The development of sound and effective evaluation techniques to assess the technical and economic results of cloud seeding operations.

"Progress in Weather Control". By Irving P. Krick, Pres. Water Resources Development Corp. *Journal AWW Ass'n.* August.

Five Years of High-Rate Filtering

In 1948, a study of high-rate filtration was begun at the South District Filtration Plant of Chicago, Ill. under the direction of John R. Baylis. In the August issue of the monthly publication of the Bureau of Water he tabulates the results of each of these five years, and summarizes the conclusions drawn. Among these are the following:

"For water not high in turbidity, and turbid waters properly conditioned, a filtration rate averaging 4 gallons per minute per square foot will produce no impairment of the quality of the water. This is assuming the maximum rate will not exceed 5 gallons per minute. The main reason for setting the maximum rate at 5 gallons per minute is the high initial loss of head occurring at higher rates, and not the passage of flocculated matter through the filter beds.

"The filter runs averaged slightly more than one-half as long for the 4-gal. rate as for the 2-gal. rate. Because of the high initial loss of head on the 4-gal. rate filters the expectation would be that there should have been slightly more than twice the number of filter washes. Greater penetration of the coagulated material into the filter bed most likely was the reason for this.

"The conditioning of water prior to passing it through filters should be good; that is, in going from a 2-gal. rate to a 4-gal. rate the water should be mixed and settled the same period of time as for the lower rate. No saving therefore would result in settling basin capacity. The mixing time also should be the same. In other words, if a mixing time of 45 minutes and a settling time of 4 hours are set as desirable, these periods of mixing and settling

should be the same regardless of filtration rate.

"The saving is in the cost of constructing the filters, and a slight decrease in operating cost. Approximately the same amount of wash water is required. Also a few parts of the filter, such as some of the valves, have to be replaced in proportion to the number of times used. Therefore, only a small saving in maintenance may be made such as the maintenance of a smaller building and a lesser amount of piping. A conservative estimate of the saving in construction cost of the entire plant is 5 percent. The saving in operation and maintenance will vary widely, and a guess of 2 to 5 percent is made."

In 1953, the average filter performance for filters operating at a 2-gal. rate was 0.69 million gal., and for those operating at a 4-gal. rate it was 0.88 million gal. This indicates a saving of 27 percent in wash water.

"Continued Tests on High-Rate Filtration". By John R. Baylis, Engr. of Water Purification, *Pure Water,* August.

Experience With Plastic Pipe

The author summarizes as follows reports from the American Water Works Co. and water works managers in New England who have used Carlon plastic service pipe: 1. There have been no failures of the plastic pipe of the type now being used. 2. No trouble has been experienced with the bronze adaptors. 3. Difficulty has been experienced with the metal bands, which clamp the pipe to the adaptors, the trouble being in the nature of stripped threads on the screw, or a broken band. Experiments are now being made with a so-called Bandit Tool. 4. Plastic pipe is a con-conductor and therefore can not be thawed by electricity. This has brought objections from prospective users in the colder climates. 5. The pipe has to be carefully laid, as it is subject to crushing or cutting if laid in a rocky trench and carelessly handled. The pipe does not uncoil and stay put like copper, but is springy, and men have to stand on it to hold it down until partially back-filled. All made the comment that the pipe is being used experimentally and its limited period of use does not permit an honest opinion of its value.

Plastic pipe has elasticity, which lead and copper do not have, and so may be better able to cope with

water hammer. It becomes very soft and plastic at about 270°F.

"Experience With Plastic Service Pipe". By Allen M. Symonds. *Journal, New England W.W. Assn.*, September.

Controlling Water Milfoil

Water milfoil is a plant that grows almost wholly under water, to a depth as great as 14 ft. Propagation is by means of sprouts from the roots, from seeds, and by the rooting of stem fragments. It has been very troublesome in Lake Austin, the source of water supply and recreation center of Austin, Texas. To eliminate it, the city tried under water mowing and use of an arsenical herbicide, both unsuccessful. Also it has been the practice to lower the lake level for some six weeks in January and February as a means of checking weed growth; but the roots did not die and sprouted again in summer. Spraying the surface of the lake with 2,4-D, with 2,4-D in combination with copper sulfate, with copper sulfate alone, and with Nigrosine, were not sufficiently effective, and soil sterilization was tried and proved to be more so. Borax and CMU were used, borax at the rate of 10 to 15 lb. per sq. ft.; CMU at the rate of 1 lb. to 160 sq. ft. Also effective was the use of 1 pint of 2,4-D ester in 6 gal. of water sprayed over 10,000 sq. ft. Of the three methods used when the lake level was lowered, the 2,4-D ester was the least expensive. The others are about equal in cost; with borax at less than 10 cts. per pound, it will be the cheaper.

"Controlling Water Milfoil in a Texas Reservoir". By Ernest W. Steel, Prof. of San. Eng., and Ben B. Ewing, Prof. of Civ. Eng., Univ. of Texas. *Public Works*, October.

Tests for Intestinal Virus

In order to determine if various types of water and sewage treatment are as satisfactory in eliminating viruses as bacteria, the comparative survival of coliform bacteria and viruses in water under several environmental and water treatment conditions was studied. Comparison made between coliform microorganisms and *Bact Coli* B bacteriophage, Coxsackie virus and Theiler virus indicates that their relative survival depends upon the type of treatment involved, including storage at various temperatures, subjecting to chlorination and to ultraviolet irradiation. With the exception of storage in the cold and weak chlorine doses, water treatment that destroys coliform bacteria can be counted on to destroy viruses as well.

"Significance of the Coliform Test in Relation to Intestinal Virus Pollution of Water". By F. W. Gilcreas and Sally M. Kelly, N. Y. State Dept. of Health. *Journal, New England W.W. Assn.*, September.

Other Articles

"Land Ownership" of watersheds. By W. A. Kunigk, Supt. Water Div., Tacoma, Wash. Journal Am. W. W. Assn., August.

Mineral Characteristics of Maine Public Water Supplies. By Raeburn W. Macdonald, Sr. San. Engr., Maine Dept. of Health. Journal, New England W. W. Assn., September.

"New York's Quest for Interstate Water". By Karl R. Kennison, Chief Engr., Bd. of Water Supply. Journal, New England W. W. Assn., September.

"Domestic and Industrial Water Supplies Face **The Pollution Problem.**" By Malcolm Pirnie. Journal, New England W. W. Assn., September.

"Operation of Small Waterworks: Equipment and Materials". By A. E. Clark, Mgr. Suburban Utility Dist., Nashville. Water and Sewage Works, September.

Miami Subdivisions

(*Continued from page 79*)

fication. The completely treated and chlorinated effluent will be discharged into the intracoastal waterway at the rear of the property. Sludge from the Spirahoff unit will be discharged into tank trucks within the building and carried to approved points of disposal.

Largest of the industrial systems in the Miami area is the plant at the Miami International Airport, operated by the Dade County Port Authority. Various parts of the tributary system, constructed during the war and post-war years, comprise a considerable mileage of collecting sewers together with pumping stations and force mains. The two treatment plants which served this part of the airport property are now replaced by a high rate trickling filter with primary and secondary clarification, chlorination, sludge digestion and drying beds. The problems at the plant are multiplied by the conditions which result from the growth and use of the facilities at the airport. Wastes from the planes are highly concentrated and create a sudden increase in BOD and suspended solids. Plane maintenance facilities contribute metallic, acid and oily wastes which may tend to upset the biological processes. This airport is one of the busiest in the world and the problems of sanitation are those of a good sized town with considerable fluctuation in the type of waste created by its industries. Eastern Air Lines and National Air Lines have presently completed large maintenance buildings at the airport and plans have now been drawn for a new combined passenger terminal, on which work will be begun in the near future. The overloading of the old facilities and the constant change and expansion attendant upon the increase in air cargo and passenger traffic required that an expansion and improvement program be initiated. The engineering on this program was done by Rader Engineering Co. which replaced the two old and overloaded sewage treatment plants with the new clarification and high rate filter plant. Infilco supplied the treatment plant equipment and Fairbanks - Morse the recirculating pumps, as well as the pumps at the new lift station.

The problems of the mushrooming Miami area, although resulting in considerable complication in sewage treatment plant design as exemplified at the Miami International Airport, are more nearly typified by the problems of stage development for the subdivision areas where it becomes necessary to start construction of the second stage, details for the third stage and planning for the fourth stage before the first stage of construction has been put into operation. The growth of this area would be completely stifled if it were not for the foresight and progressive planning of the engineers and developers since Miami, already spending many millions on water supply and a new sewerage system, cannot hope for many years to satisfy all the needs for service within its own limits, much less serve the outlying communities.

Design Data

To obtain more specific information on design, we wrote Earle M. Rader of Rader Engineering Co. of Miami. His reply, in part, follows:

The volume and variability of flow upon which designs are to be based will depend not only upon our engineering judgment but also upon the judgment of other bodies

which may have jurisdiction over some phases of the planning. For example, in our design for a sewage treatment plant to replace the unsatisfactory septic tank and drain field disposal for an apartment house development we had the opportunity to examine the records of the water consumption extending over a period of more than a year. In this case we found that the maximum month indicated a lower average sewage flow than figures which are acceptable to the State and Federal authorities where such records are not available.

Similarly in the case of design for the Miami International Airport we had a record of the sewage flow and of the number of employees and passengers in the tributary area. In this case it was interesting to note that a design figure of 25 gallons per employee and 2.5 gallons per passenger gave a reasonable factor of safety above actual quantities as measured. The rate of flow will of course depend upon the concentration of use over any period selected for determination, and since the daytime shift of employees is by far the largest concentration, this will give an average rate of flow which will be for the eight-hour period, three times the 25 gallons per employee in that shift.

Where records are not available, as is the case in the new housing developments, we find it desirable to use an average of 80 gallons per capita per day, to which we add at least 500 gallons per acre for infiltration and a factor for the design flow which may vary from 125 to 150 percent depending upon the local conditions. The rate at which sewage will reach a treatment plant will depend not only on peaking factors but also on the local conditions, such as pumping capacity and the damping effect in the main sewers.

In our high rate filters we have used design loading factors of 2200 and 3000 pounds of BOD per acre-foot per day, and have usually used a 6-foot depth of stone although indications are that a lesser depth will be satisfactory. Considerable study and research have been devoted to the problem of using Florida aggregates for trickling filters and it is probable that a more economical source of media will be found. Our completed plants have generally used an imported granite in the 2- to 4-inch size, having qualities which would undoubtedly be entirely satisfactory in colder climates. The requirement for the freezing and thawing tests is unnecessary in this sub-tropic climate.

In providing for easy expansion of our sewage treatment plants we have not yet found it possible to produce a design which can be taken down off the shelf and made suitable for a particular set of conditions. In one case we have provided primary and secondary straight line settling tanks side by side and have provided in each of them scraper mechanism of type ordinarily used in primary tanks. By so doing we have provided for the conversion of the secondary tank to a duplicate primary tank at a later date. In other cases we have laid out what may be three or four stages of development and have constructed only such part as is necessary for a fraction of the eventual capacity.

In still other cases we have designed plants which would combine, at stage 1, the functions of primary settling and sludge digestion in a circular Imhoff type of treatment unit which at a later stage will become a digester. We have also carried this idea further and in one plant provided not only for con-

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version of the circular Imhoff tank to a digester but also a later similar conversion of a combination unit which in its initial stage incorporates a high rate trickling filter, a circular secondary tank and an annular chlorination chamber.

The factors which lead to designs of this nature are: 1) the topography and 2) the horizontal space limitations. Because of the flat terrain and of high ground water level it becomes impracticable to build structures into the ground or to depend upon gravity flow for any distance much greater than a half mile. The same limitation imposed by the flat terrain, very close to sea level, results in an extreme reluctance on the part of the developers to the use of more than the barest minimum of area for sewage treatment purposes.

The problem of sludge disposal for the small plants is best met by the use of tank-trucks into which the sludge is drawn for disposal at approved points. In order to avoid odor complaints provisions are made for filling the trucks behind closed doors and exhausting the air from within the closed area through activated carbon filters. In the South Florida area, where until quite recently, sewage disposal has been merely by septic tanks and drain fields there are many companies which make a business of emptying septic tanks. The use of such companies for disposal of sludge from a small sewage treatment plant is more economical than a system of sludge drying beds or incineration. Provisions are made, in some of our designs, for vacuum filtration at a later stage. There still remains the problem of sludge disposal but the volume can be much reduced by filtration. It appears possible that, as the total volume of organic material which thus has to be handled will increase through the future years, a commercial method of handling and salvaging this material may be found.

• • •

Air Placed Concrete Used in Baltimore Harbor Face Lifting

RENOVATION of 3,280 linear feet of dock front was recently completed by the Baltimore Department of Public Works, Bureau of Harbors, Baltimore, Maryland, using the technique of air-placed concrete and new labor-saving equipment. The entire job of refinishing the dock front took only 20 working days using the new equipment. The job

was to fill cracked joints in the three-foot granite wall which ran along the dock. In addition to the cracked joints, weathering and the impact of vessels laying alongside the pier had caused some breaks and cavities in the wall. These ranged from slight weathering to large holes half way through the wall.

Since the work to be done was spread out along the length of the dock, it was necessary to make the equipment as portable as possible. This problem was solved by mounting the equipment on a portable rig that could be easily moved from one spot to another. The equipment used for the restoration consisted of a Bondactor which was used to gun the concrete into the joints and cavities; and a Mix-Elvator which mixed the aggregate and deposited it directly into the hopper of the Bondactor. Richard Tyler, Senior Associate Engineer, reports that by using these two pieces of equipment mounted on the rig, the crew necessary to do the work was reduced to two men. One man was used to operate the controls on the Bondactor and the Mix-Elvator while the other worked as nozzleman and gunned the grout into the cracks and cavities.

Repair work consisted of first cleaning and chipping the joints of all loose mortar, spalls and other debris. After the joints were washed and blown clean with compressed air, they were filled with the Bondactor. For this application, a ¾-inch nozzle was used and the concrete was gunned under reduced pressure. The placement of the grout was very easily controlled using the ¾-inch nozzle and air pressure of 25 psi. The joints and cavities were completely filled with mortar and the mortar was allowed to harden somewhat. After this partial hardening, the mortar was sculptured and trimmed down to an even surface. A total of 216 bags of cement and 41 tons of sand were used to complete the job.

The combination Bondactor-Mix-Elvator portable rig proved to be so satisfactory that in addition to the repair work on the dock, a considerable amount of deteriorated curbing was replaced and some bridge pier corners were shaped and pointed up. The department is, at the present time, planning further rehabilitation of many of the City-owned piers and bridges in Baltimore Harbor using this material and labor saving equipment.

PUBLIC WORKS
EQUIPMENT NEWS

Published Monthly **November, 1954**

Drott "Four-in-One" Increases Loader Versatility

An extremely versatile attachment has been announced by Drott for the TD-6 and TD-9 International crawler tractors. Called the "Four-In-One" attachment and easily interchanged with standard bucket, it is presently being manufactured for attaching to the TD-6 (⅞ yd.) and TD-9 (1¼ yd.) Skid Shovels. This attachment enables an operator to do a variety of jobs that previously required four separate attachments. By merely moving a hydraulic control lever, the Four-In-One transforms into a machine that will perform with the same degree of efficiency as a Skid Shovel, Bulldozer, Bullclam Shovel or Clamshell. Uses are:

SKID SHOVEL—With the clam fully closed, straight forward loading is accomplished by tilting the bucket forward as desired. In this position, the Four-In-One attachment has the same roll back at ground level as the Skid Shovel. When loading trucks, bins or stock piles, discharging of material is possible by the bottom dump. That is, the clam is opened allowing the material to fall out. This feature adds more than two feet to the dumping height.

BULLDOZER—With clam open, the rear of the bucket becomes the dozer mold-board. Depth of cut is accomplished through radius control, that is, the degree of cut is regulated by the forward and backward pitch of the blade over the loader shoes, rather than by lifting and lowering of push beams. However, the push beams may be raised and lowered as desired, too. This method of tilting the blade over the shoes makes depth control practically a precision operation.

BULLCLAM SHOVEL—Performs all phases of sanitary fill operations efficiently. The design of the curved clam, plus a special wearplate, brings an ironing, crushing and compacting action ahead of the clam as it moves forward. When loading, the clam acts as a depth gauge, because opening it ten inches allows the cutting edge to lower two inches.

Bulldozing with clam open. Depth of cut is controlled by the blade angle

Clamshell action speeds loading from stockpiles by taking a positive bite

Ground level transportation of load relieves strains. Note Hydro-Spring

A smooth even surface is always created for the tractor to pass over. When loaded, the operator closes the clam and rolls the bucket back over the skid shoes for ground level transportation.

CLAMSHELL—Opening the clam wide and rolling the unit forward makes it possible to operate as a clamshell for picking up stock piled or other loose material. The clamshell is brought down on the loose material and closed into the pile, filling as it goes. The loaded clamshell is then rolled back on the skid shoes for ground level transportation. This entire operation is done hydraulically by the operator, while the tractor stands still.

For further details write Drott Mfg. Corp., Milwaukee 8, Wisc., or circle No. 11-1 on the coupon.

Rotary Snow Plow Handles 3 to 4 Tons per Minute

Mounting easily on most wheel-type front end loaders, this rotary snow plow will dig snow as deep as the tractor and will load a 5-ton dump truck in 3 seconds, according to the manufacturers. A casting chute extension makes truck loading simple, as the operator can rotate the chute 180° and can load trucks on either side or straight ahead. Wet, chunky or hard-packed snow is handled easily. The plow is available in three plowing widths and can also be mounted on 4-wheel drive Jeeps. More from Wm. Bros Boiler & Mfg. Co., Minneapolis, Minn., or circle No. 11-2 on the coupon.

Rotary plow mounts on tractor front-end loader, moves lots of snow quickly

Portable Masonry Hole Cutting Machine

This new portable, high speed, light weight machine uses a self-sharpening diamond drilling bit to cut holes ½-in. to 10 ins. in diameter through hard aggregate, including steel reinforced building material, to a depth of 18 ins. (Deeper holes may be drilled by placing an extension shaft on the bit.) It comes in two models, 1 hp and 2 hp. The drilling time of a six-inch diameter hole in one foot of concrete is less than two minutes. Will cut cores. Molco Drilling Machine Corp., 1100 20th St., NW, Washington, D. C., or circle No. 11-3 on the coupon.

Smooth plug of reinforced concrete is cut from 12" slab in under 4 minutes

Tamper-Proof & Weather-Proof Tool Trailer

This tool trailer will carry a ton of tools and will trail at high speeds. Features include: A sliding tray, blinker lights, lap fold hinge, rear bumper, padded drop legs, tail light, work shelves, side compartments, cylinder locks, ball hitch, safety cover latch and standard batteries for blinker lights. Full data from Aeroil Products Co., Inc., Wesley St., South Hackensack, N. J., or circle No. 11-4 on the coupon.

Safe storage and transit for tools is offered by this rugged tool trailer

Motorized Roller for Small Compacting Jobs

With a weight range of 1500 lbs. dry and 2500 lbs. with water ballast, this new motorized roller is suited for a wide range of compacting. It has been found useful for driveway, parking lot and patching work and for sealing larger surface prior to rolling with heavier rollers. Engine is 8 hp. Briggs & Stratton. Full data from Gabb Special Products, Windsor Locks, Conn., or circle No. 11-5 on the coupon.

Hydraulically Operated Backhoe for Use on Crawler Tractors

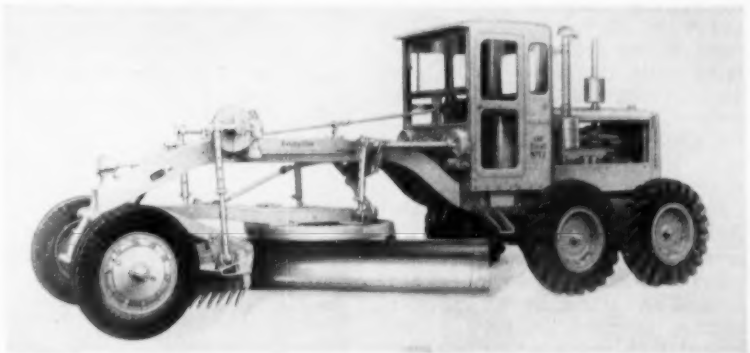
A new backhoe, called the "TerraTrac-Pippin Special" has been developed through the combined efforts of the American Tractor Corp., Ft. Wayne, Ind., and the Pippin Construction Co., White River Junction, Vt., to gain maximum working efficiency of both tools. With an over-all width of 5 ft., and a height of less than 5 ft., this unit can be operated in close quarters, its reach of 16 ft. making it possible to dig clean, vertical-walled trenches 10 ft. below grade. Dumping height is 9 ft. Detailed information from American Tractor Corp., Ft. Wayne, Ind., or circle No. 11-6 on the coupon.

Jeep Mounted Trencher for Digging to 6 Ft. Deep

This is said to be the first gear driven trencher with gears running in oil. It is streamlined and the unit is well forward in the Jeep body over the frame. By moving the center of gravity ahead, more weight is placed on the front wheels, making for better traction, straighter trenches, etc. The box section frame is electrically welded, completely enclosed, and serves as a dust proof housing for the major units. In addition, lubrication of the five major bearings has been provided with fittings beside the control levers. The boom is raised and lowered hydraulically to any position in the 190° arc of travel. Four levers control operation. This unit will handle trench widths from 6 to 14 ins. and any depth up to 6 ft. Weight is approximately 1750 lbs. Detailed information from Auburn Machine Works, Inc., Auburn, Nebr., or circle No. 11-7 on the coupon.

Jeep-A-Trench mounting and power takeoff designed for best operation

Improved Motor Grader is Announced



The improved No. 12 Caterpillar motor grader now has 115 hp and speed has been increased to 4 miles per hour in 2nd gear and 21.5 in 6th gear. In both the Cat No. 12 and No. 112, convenient one lever from-the-seat starting is now available and they are also equipped with accelerator-decelerator pedals that permit changing speeds without changing the throttle setting. More data from Caterpillar Tractor Co., Peoria, Ill., or circle No. 11-8 on the coupon.

Hydraulic Backhoe Designed for Loader

New backhoe for Hough "Payloader" Models HE and HF; other models will follow

A back-hoe designed specifically for the Hough Payloader Models HE and HF is now being manufactured by Wain-Roy Corporation. Completely hydraulic, it provides a digging depth of 12 ft 6 ins. below grade. The "wrist-action" bucket speeds up digging because the hoe does not have to go through the complete cycle on all digging operations. The boom design and bucket action permit digging vertical bell holes, vertical side walls and square corners; and maintain a smooth level grade at the bottom of the trench. Another feature is the ability to dig trench and dump spoil at any radius up to 190°, enabling the unit to reach "hard-to-get-at" places. The back-hoe can be removed in a half hour and attached in less than an hour. Complete information from Wain-Roy Corporation, Hubbardston, Mass., or circle No. 11-9.

Utility Blade Can Do Many Jobs in Public Works

The Blackhawk heavy duty utility blade is a rear mounted blade for plow tractors equipped with a 3-point hitch system. The blade weighs about 450 lbs. and can be set in any of 9 angular positions for forward travel, 3 for reverse; and has 5 tilt adjustments, 8 blade pitch adjustments and quick offset facilities, all without wrenches. Accessories include a ditching point for deep penetration, side plates and skid shoes for snow removal and a gauge wheel attachment for smooth finish ditching or grading. In addition to ditching, grading, levelling, backfilling and road work, it is useful for snow removal. More from Arps Corp., New Holstein, Wisc., or circle No. 11-12 on the coupon.

Utility blade can speed backfilling, levelling, grading and snow removal

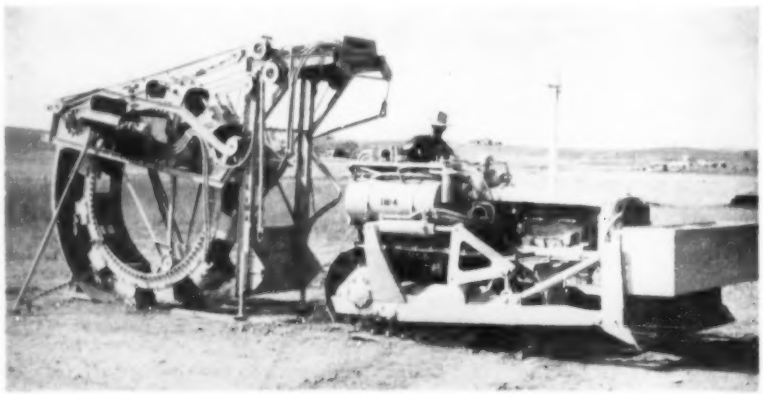
Portable Incinerator for Disposal of Industrial Wastes

Designed to incinerate all average dry waste, this portable incinerator is made in three standard sizes, with ranges from 200 to 450 lbs. per hour. The door is extra large to handle bulky material, and is counterbalanced for easy operation. Combustion efficiency is high; the gas travel is unusually long; the stack is self-supporting. Mounting is on skids. Refractory lining is of 4-in. Plicast Tuff-Lite. More data from Plibrico Co., 1800 Kingsbury St., Chicago 14, Ill., or circle No. 11-10 on the coupon.

Heavy-duty industrial power unit. A horsepower of from 252 to 290 is provided in this new unit, which operates with 12 volts on either natural or LP gas. Dual 6-cylinder engines mounted in parallel are geared to a single power take-off shaft. Displacement is 1600 cu. ins. and bore and stroke are 5 5/16 ins. by 6 ins. Counter-clockwise rotation of the power takeoff shaft is standard in the 1954 production of these units, with clockwise rotation planned for later production. More information from Minneapolis-Moline Co., Box 1050, Minneapolis 1, Minn., or circle No. 11-11 on the coupon.

Unimatic Detachable Ditcher for Use With Tractor

This detachable ditcher is an attachment for a Caterpillar Diesel D-4 tractor and can be detached within 30 minutes or less. It will dig to a maximum depth of 66 ins. with the width of cut ranging from 15 ins. to 24 ins. in increments of an inch. The Unimatic drive permits the ditcher to move forward at any speed to 26 ft. per minute. New pulley design eliminates lateral belt travel. The length with a straight bulldozer is 22 ft. 8 ins., and the width 8 ft. 3 ins.; the overall height is 9 ft. 11 ins.; weight ranges from 6,660 lbs. to 6,930 lbs. Complete information from an Unimatic-Caterpillar dealer or from Unimatic Corporation, P. O. Box 1166, Tulsa, Okla., or by circling No. 11-13.



Unimatic ready to cut ditches for drainage, footings, sewers, water or gas lines

GATE IS MECHANICAL PARKING LOT ATTENDANT

This electric parking lot gate eliminates labor costs and provides fool-proof parking lot control. Operation is simple. The driver stops at the gate and, without leaving the car, puts a coin in the coin box. This actuates a 3-way magnetic control which opens the gate to admit the car and closes the gate only after the car clears, but prevents passage of more than one car. The gate to the exit passage may be operated by a treadle. Coin boxes can be arranged to take coins or tokens or to operate by a key.

Electric parking lot gate eliminates labor costs; gives foolproof control

Full data from Western Railroad Supply Co., 2428 South Ashland Ave., Chicago 8, Ill., or circle No. 11-14 on the coupon.

New Smaller Truck Mixer for Concrete

A 4½-cu. yd. truck mixer is now being made by Blaw-Knox Co. (This model is also made in 5½ and 6½-cu. yd. sizes.) These truck-mixers are said to mix ½-cu. yd. more than their normal rating, conforming to the standards of the Truck Manufacturers Bureau. The

This is a big truck mixer that can be mounted on a short wheel base truck

mixers can be furnished with an open or closed end drum and are equipped with large diameter drums for fast and thorough mixing. The charging hopper eliminates spilling of materials during the charging operation and permits fast loading (8 to 9 seconds per yard). The entire chute assembly can be swung to one side to discharge into buckets or hoppers. Complete data from Blaw-Knox Co., Blaw-Knox Equipment Div., Pittsburgh 38, Pa., or circle No. 11-15 on the coupon.

Heavy-Duty Digger for Clay, Concrete and Shale

The Model DD-30 digger permits a quick change of working steels such as clay spades, flat picks, moil points, chisels, asphalt cutters, frost wedges, dirt tampers and others. Important features include a new type wafer plate valve with differential porting, assuring positive piston hammer action; a built-in lubricator which gives pressure lubrication to all moving parts. Many of the parts used in this unit are the same as used in other Davey tools. Light starting and running are accomplished through the use of a metered throttle valve. This digger is 23 ins. long, 7 ins. wide and 4½ ins. in depth. Weight is 31 lbs. More data in Bulletin E-533 from Davey Compressor Co., Kent, Ohio, or circle No. 11-16 on the coupon.

Hydraulic Digging Wheel Control on Trencher

Hydraulic control of the digging wheel is a feature of the new 150 wheel-type "Trenchliner" developed by the Parsons Co., subsidiary of Koehring Co. The digging wheel travels up and down a vertical mast, the hydraulic control raising and lowering the wheel so as to maintain a close tolerance to the grade. This new trencher digs from 1 to 25 ft. of trench per minute, to 69 ins. deep and 16 to 26 ins. wide. Specifications and more information from Parsons Co., Newton, Ia., or circle No. 11-17 on the coupon.

Convenient Heat Source Furnished by Large Insto-Gas Cylinders

For all kinds of instant and portable heat, Insto-Gas has developed a "35" cylinder which can be used with salamanders for heating work, for melting lead and other joint material and for many other kinds of work. These provide a clean blue flame, without smoke or monoxide fumes and are designed for most effective heat distribution. They will produce to 150,000 btu per hour. More from Insto-Gas Corp., Detroit 7, Mich., or circle No. 11-18 on the coupon.

Classified Advertising and Used Equipment For Sale

Portable Air Compressor for City and County Work

This portable air compressor has a metal housing to protect it from weather and tampering. It will deliver 55 to 60 cfm of air at pressures up to 100 psi, and can be towed at automobile speeds. It will operate a paving breaker in the 60-lb. class, a rock drill, a spray painting outfit or a sandblast with 3/16-inch nozzles. Ask for the catalog sheet on the Model 55 from P. K. Lindsay Co., 97 Tileston St., Everett 49, Mass., or circle No. 11-19 on the coupon.

Grid Roller for Bituminous Salvage and Fill Compaction

In this roller, the grids are cast from alloy steel and heat treated, giving the appearance of woven open mesh made by interlacing 1½-in. bars on 5-in. centers. Net opening between bars is 3 ins. Surface hardness is above 300 Brinell. Weight of the grid roller and frame is 12,400 lbs.; with concrete ballast, total weight is to 30,000 lbs. This roller permits economical salvage of

First step in the salvage of bituminous material with the grid roller

aggregate and binder from old bituminous pavements, quickly crushing and reducing to size all material after initial ripping. Also crushes and compacts pit run material. In either case, high density is obtained with few passes. Excellent folder is available from Hyster Co., 2902 NE Clackamas St., Portland 8, Ore., or circle No. 11-20 on the coupon.

Mobile Batch-Type Asphalt Plant

Said to be completely portable, so that it can be hauled anywhere, this new batch-type asphalt plant is especially fine for work in rural

areas. An extra large dryer is provided to average 40 to 50 tons of aggregate per hour, while the plant itself has a capacity of as much as 55 tons an hour. Power is gasoline, diesel or electric. One man, in most cases, can run the entire plant. More from Standard Steel Corp., 5001 Boyle Ave., Los Angeles 58, Calif., or circle No. 11-21 on the coupon.

New Light 3/4-Yard Shovel-Crane

This machine (Model LS-68) takes the place of Model LS-52, and has advanced features including Speed-o-Matic power hydraulic controls; a heavy, wide tower frame 11'0" overall length—9'2" wide with 24" shoes and 9'8" with 30" shoes. (A long-wide frame is also available for 36" shoes with a ground bearing area of 63 sq. ft.) Heat-treated single-flange track rollers 10-in. dia., are mounted on 2½ in. dia. shafts. This crawler-base rig is fully convertible to all standard front end attachments with a minimum of conversion time, with no major changes to the main machinery. Weight is 35,300 lbs. Complete data

New Link-Belt Speeder Model LS-68 offers many advanced design features

in Bulletin No. 2541 from Link-Belt Speeder Corporation, Cedar Rapids, Iowa, or circle No. 11-22 on the coupon.

LOW-COST STADIUM RESURFACING

Maximum economy and durability have been built into new surfaces for traffic areas of the Richmond, Va., public stadium through the use of a special asphaltic composition.

The paint previously used required frequent replacement and did not offer a sufficiently smooth and durable walking surface.

After making studies of the various types of surfacing materials available, contractor H. C. Lane of Richmond developed a special combination of two, cold-applied asphaltic compounds—Laykold Walk-Top and Laykold Fibre coat. This combination appeared to provide longer lasting protection at a low cost and, at the same time, provided a sound-deadening effect. To resurface the traffic areas of the stadium, 5,000 gals. of Walk-Top and 250 gals. of Fibrecoat were required. Walk-Top was hand-troweled on the walking surface, and Fibrecoat was brushed on the risers. This ease of application enabled the contractor to complete the entire job in less than one week at a cost of approximately 9 cents per sq. ft.

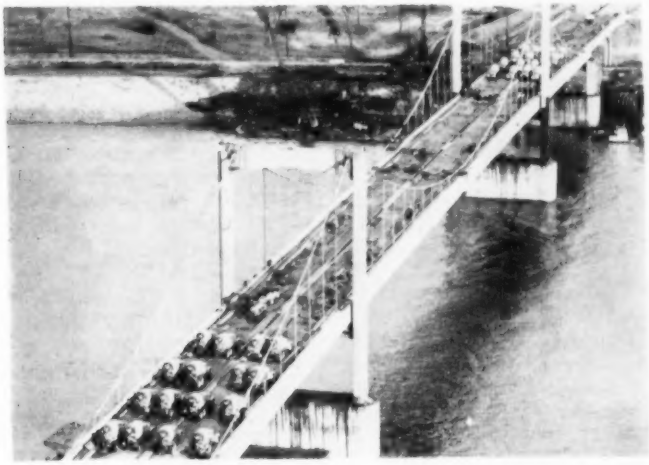
● COLD-APPLIED asphaltic materials now provide a smooth, resilient and durable walking surface.

No delay was encountered because of early morning dew since the compositions were developed for application alike on dry, damp or moist surfaces. No heating equipment was required, since the surfacings were applied cold.

Fibrecoat is a weatherproof, mineral-armored asphalt, developed during World War II to meet military needs for a protective coating for roofs, masonry, and metal. It is composed of oxidation-resistant, processed asphalt and slate-like, heat-resistant, graded mica flakes. Walk-Top is a specially compounded asphaltic material designed for easy troweling or brushing. It sets to a tough, waterproof, resilient surface and is formulated in red, green or black colors. Black was used on the Richmond stadium.

INDEX OF ADVERTISEMENTS

—Worth Seeing



"They also serve who only stand and wait." (Above) a fleet of parked International heavy duty trucks overcoming torsional resistance on new Paseo bridge, Kansas City, by weighting both ends of it with the heavy trucks.

This centenarian cast iron pipe was still going strong when workmen broke it to get it out as part of superhighway construction work in Chicago. Contemporary lengths of the same water main, originally laid in 1853, remain on the job under Adams St. as good as new.

The sign says SLOW but you stopped! What you are *really* looking at is a Fenton barricade. All metal, weighs less than wood, adaptable to Scotch Lite or attachable lights. Fenton Industries, Los Angeles, makes it.

WORTH TELLING

by Arthur K. Akers

★ JOHNNY COOPER joins Pak-Mor Manufacturing Co. (refuse bodies) as national sales representative, headquartering in San Antonio. Liaison between Pak-Mor and its distibutors and users, his job. O. M. Anderson also joins their engineering and planning staff.

★ TOO LATE for our October issue, we had word of General Electric Company's revised film on "Clean Waters," advertised with us then. It was premiered at the Cincinnati F.S.I.W.A. meeting—a 25-minute, full-color, sound picture. Those interested please write us about it.

★ JACK W. WEBER is new sales manager, Aeroil Products Co., South Hackensack, N. J.

Mr. Weber

Mr. Freeman

★ THE PERMUTIT CO., New York, water conditioning, names A. McLean Freeman as advertising manager, succeeding H. H. Wilkinson, retired.

★ B-I-F, Providence, news includes the stirring story of their water chlorination relief for New England communities hard hit by hurricane "Carol." Also: Virgil W. Langworthy is new project-engineer for Omega Machine division. And Builders, Pacific Inc. division's new name—B-I-F Pacific, Inc., where Lee Chamberlain remains president and sales manager.

★ GALION IRON WORKS & MANUFACTURING CO. appoints Charles O. Evans district representative, South Atlantic coastal states; Robert N. Shears, Pacific Northwest.

★ GAR WOOD sets up two new factory sales branches, in Tulsa and in Springfield, Ill., with D. C. Royce and Carroll Merriett, respectively, in charge. Harold C. Clark is now product sales manager on Load-Packer refuse bodies.

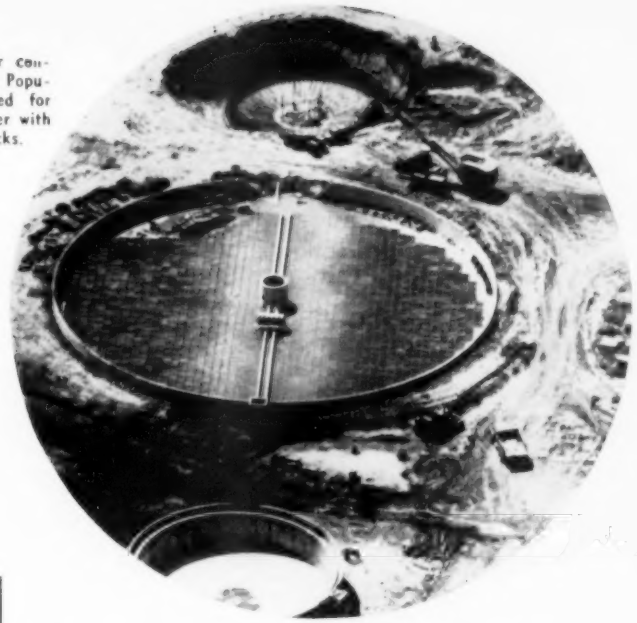
★ WESTINGHOUSE ELECTRIC CORPORATION appoints A. C. Meixner assistant sales manager, apparatus products, Pittsburgh.

★ ADD FILMS: Colorado Fuel & Iron Co., Box 1920 Denver, "Reinforced for Life" on welded wire reinforcing. Prints loaned free.

★ YOU ALL have heard of the haste-mad New Yorker who squawked if he missed one section of a revolving door. Now our circulation gal, Angela, goes him one better. She came in late one morning. "Missed my regular step on the subway station escalator," she pouted prettily in explanation.

● **OFFICERS of "Quick-Way" Truck Shovel Co., Denver; L to R: W. H. Madden, Vice-President & Gen. Mgr.; L. T. M. Ralston, President; and W. R. Knowles, Treasurer.**

125 foot trickling filter under construction at Independence, Mo. Population served, 10,000; designed for 15,000. Modified high rate filter with recirculation. TFFI bottom blocks.

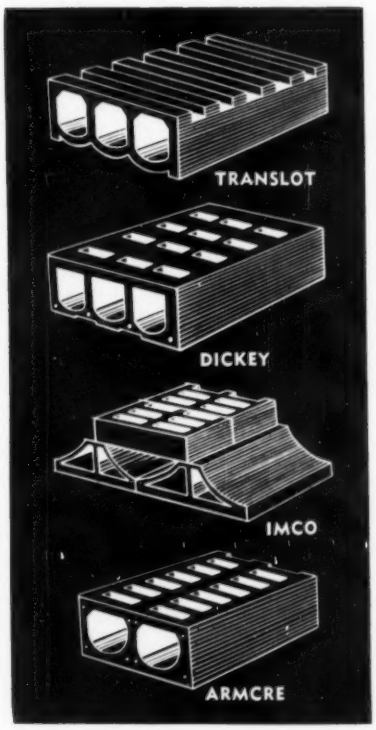


Why Trickling Filters are best—

EASY TO EXPAND

Trickling filters, properly designed, are easy to expand to meet future increases in population or loading. Another filter, or perhaps a change from low rate to high rate, will solve the problem for many years to come.

You'll be sure to get maximum results from trickling filters when you install TFFI *vitrified clay filter bottom blocks.* The full illustrated story of their advantages, efficiencies, and economies is in the new 1954 revised edition of the popular HANDBOOK OF TRICKLING FILTER DESIGN. If you lack a copy, just write any member of the Institute listed below for one. It's free.



TFFI

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Natco Corporation
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Kansas City 6, Mo.

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For more details circle No. 20 on the Readers Service Card

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Just as a show-dog's winning pedigree is no accident, neither is the pedigree of a Wallace & Tiernan Chlorinator. Both are distinctive and reflect the result of years of selection, training and experience.

Selection, in the sense of progressive. laboratory-tested improvements in design and construction . . . Improvements which increase the value of dependability "inbred" in W&T Equipment for forty years.

Training, in the sense of a nation-wide staff of Chlorination Specialists, equipped to give prompt service and installation advice on all W&T Equipment.

Experience, in the sense of the many thousands of W&T Chlorinator installations, now meeting the particular daily chlorination requirements of communities all over the world.

The pedigree of a W&T Chlorinator is an open book. Why not write for a free introductory chapter today?

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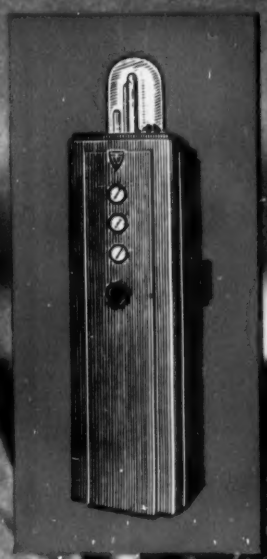

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